ENERGY TRANSITION PARTNERSHIP

Powering Prosperity and Enabling Sustainability in South East Asia

Demand Side Management for the Philippines

Milestone 2: DSM Program Report

By

IIEC
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Abbreviations

AC	Air Conditioner
AEC	Angeles Electric Corporation
ALM	Active Load Management
AT&C	Aggregate Technical & Commercial
BATELEC II	Batangas II Electric Cooperative, Inc.
BEE	Bureau of Energy Efficiency
BEMS	Building Energy Management System
BESS	Battery Energy Storage System
BOI	Philippine Board of Investments
CAPEX	Capital Expenditure
CEBECO II	Cebu II Electric Cooperative, Inc.
CENECO	Central Negros Electric Cooperative, Inc.
CEPALCO	Cagayan Electric Power and Light Company, Inc.
CHP	Combined Heat and Power
CO2	Carbon Dioxide
CREATE	The Corporate Recovery and Tax Incentives for Enterprises Act
CSP	Competitive Section Process
DA	Distribution Automation
DANECO	Davao del Norte Electric Cooperative, Inc.
DC	Department Circular
DDP	Distribution Development Plan
DER	Distributed Energy Resources
DF	Demand Flexibility
DISCOMs	Distribution Companies
DLPC	Davao Light and Power Company
DMS	Distribution Management System
DOE	Department of Energy, Philippines
DPWH-NBCDO	The Department of Public Works and Highways – National Building Code Development Office
DR	Demand Response
DRMS	Demand Response Management System
DSM	Demand-side Management

DU	Distribution Utility
DUs	Distribution Utilities
EC	Electric Cooperative
EC Act	The Energy Conservation Act 2001
EC Measures	Energy Conservation Measures
ECP	Energy-consuming Products
EE	Energy Efficiency
EE&C	Energy Efficiency and Conservation
EEC Act	Energy Efficiency and Conservation Act
EMS	Energy Management System
Enerzones	Economic Zones
EPIMB	Electric Power Industry Management Bureau
EPIRA	Electric Power Industry Reform Act 2001
ERB	Energy Regulatory Board
ERC	Energy Regulatory Commission
ESS	Energy Storage System
ETP	Southeast Asia Energy Transition Partnership
EU	European Union
EUMB	Energy Utilization Management Bureau
GAD	Gender and Development
GEMP	Government Energy Management Program
GENCOs	Electricity Generating Companies
GHG	Greenhouse Gas
GOP	Government of the Philippines
GWh	Gigawatt-hour
HEMS	Home Energy Management System
IAEECC	Inter-agency Energy Efficiency and Conservation Committee
IEA	International Energy Agency
IEMOP	Independent Electricity Market Operator of the Philippines
IERP	Integrated Energy Resource Planning
ILP	Interruptible Load Program
IRP	Integrated Resource Planning
IRR	Implementing Rule and Regulation
LED	Light-emitting Diode

LGU	Local Government Unit
M&E	Monitoring and Evaluation
M&V	Measurement and Verification
MCC	Members' Contribution for Capital Expenditures
MECO	Mactan Electric Company, Inc.
MEPC	MORE Electric and Power Corporation
MEPP	Minimum Energy Performance for Products
MERALCO	Manila Electric Company
MNRE	Ministry of New and Renewable Energy, India
MPC	Multi-purpose Cooperatives
MVIP	Mindanao-Visayas Interconnection Project
MW	Megawatt
NEA	National Electrification Administration
NEECD	National Energy Efficiency and Conservation Database
NEECP	National Energy Efficiency and Conservation Plan
NGCP	National Grid Corporation of the Philippines
NPC	National Power Corporation of the Philippines
NREP	National Renewable Energy Program
PAT	The Perform, Achieve and Trade Scheme
PDC	Philippine Distribution Code
PDM	Price Determination Methodology
PELCO II	Pampanga II Electric Cooperative, Inc.
PELP	Philippine Energy Labeling Program
PEMC	Philippine Electricity Market Corporation
PENELCO	Peninsula Electric Cooperative, Inc.
PEP	Philippine Energy Plan
PEZA	Philippine Economic Zone Authority
PGBC	Philippine Green Building Council
PGC	Philippine Grid Code
PIOU	Private Investor-owned Utility
PLS	Permanent Load Shifts
PSALM	Power Sector Assets and Liabilities Management Corporation
PSPP	The Procurement Supply Procurement Plan
PV	Photovoltaic

RE	Renewable Energy
RE Act	National Renewable Energy Act
REMB	Renewable Energy Management Bureau
RES	Retail Electricity Supplier
RFSC	Reinvestment Fund for Sustainable Capital Expenditures
SDGs	UN's Sustainable Development Goals
SOCOTECO II	South Cotabato II Electric Cooperative, Inc.
SPUG	Small Power Utilities Group
TA	Technical Assistance
TDP	Transmission Development Plan
TOU	Time-Of-Use Tariffs
TransCo	National Transmission Corporation
UNOPS	United Nations Office for Project Services
US	United States
US$	US Dollar
USAID	United States Agency for International Development
VECO	Visayan Electric Company, Inc.
VPP	Virtual Power Plant
WESM	The Philippines Wholesale Electricity Spot Market
ZAMCELCO	Zamboanga City Electric Cooperative, Inc.

1 EXECUTIVE SUMMARY

This report presents results of the technical assistance (TA) supported by the Southeast Asia Energy Transition Partnership (ETP) for the Philippine Department of Energy (DOE). The TA aims at establishing a demand-side management (DSM) program for the electric power industry for developing and implementing a range of strategies and actions that influence and incentivize end-users to reduce electricity consumption, shift load patterns, and reduce peak demand. The TA also aims to strengthen the implementation of the DSM program and its institutional framework by delivering capacity building of energy policy makers, energy planners and DU; and developing a DSM toolkit. This *DSM Program* report presents the current situation of the power industry, relevant regulatory and institutional frameworks pertaining to DSM, frameworks for DSM policy and programs, and proposed DSM programs for implementation by DU.

DSM is the planning, implementation, and evaluation of DU activities designed to encourage customers to modify the timing and level of their electricity consumption. DSM is traditionally achieved through Energy Efficiency (EE), which is the reduction of kilowatt hours (kWh) of electricity consumption, or load management, which is the reduction of kilowatt (kW) of power demand or the displacement of power demand to off-peak time. As more Renewable Energy (RE) and other distributed energy resources (DER) become integral parts of the supply and distribution systems, the electricity grid needs greater flexibility to respond dynamically and reliably to meet customer demand at the lowest reasonable cost. In light of this, integrating EE with demand response (DR) has gained more attention as a component of DSM. Overall, DSM will increase the efficiency of the distribution grid, enhance system flexibility and reliability, and delay the need for constructing additional power plants.

Overview of the Power Industry in the Philippines

Compared to other Southeast Asian countries, the power industry in the Philippines is unique and characterized by an electricity network that is divided into grid and off-grid. Luzon, Visayas, and Mindanao represent the three (3) main grids which are partially interconnected. The Philippines have deregulated their electricity sector. The Independent Electricity Market Operator of the Philippines Inc. (IEMOP), a non-stock, non-profit corporation, serves as the market operator of the Wholesale Electricity Spot Market (WESM). The main grid's transmission system remains a government asset and is owned by the National Transmission Corporation (TransCo). The National Grid Corporation of the Philippines (NGCP) operates and maintains the transmission system through a concession agreement. Delivery of electricity to the end-users is the responsibility of the distribution sector, which is served by 148 DUs, categorized as private investor-owned utilities (PIOUs), electric cooperatives (ECs), Economic Zones (Enerzones) and local government units (LGUs). These DUs and EC operate under the regulatory authority of the Energy Regulatory Commission (ERC) are also under supervision of the National Electrification Administration (NEA).

Status and Challenges of DSM

The Philippines started its DSM initiatives back in 1994 and few regulatory frameworks were established by DOE and the Energy Regulatory Board (ERB), which later became ERC, to support DSM in the country. There is evidence of initial DSM plans being developed and submitted by DUs. However, there is no evidence of any follow up implementation coordinated by ERB or ERC. In 2010, the Philippines Government instituted the Interruptible Load Program (ILP), which encourages large electricity consumers to run their own generator sets to ease demand from the grid and, in exchange, they are compensated for using their own power. MERALCO, the largest DU in the Philippines, has reported that, as of September 2022, 121 companies have enrolled in their ILP with a cumulative peak demand reduction capacity of 582 MW.

In 2014 the DOE issued Department Circular number No. DC2014-08-0014 which directs all electricity consuming sectors, particularly residential, industrial, commercial establishments, including public facilities and all other electricity end-use sectors to implement DSM programs and energy conservation measures to reduce electricity demand; and ensuring that vital infrastructure facilities (hospitals, military installations, airports etc.) maintain their regular use for reliability and adequate power supply. All DUs are obligated to implement DSM programs and other energy conservation measures; and are required to undertake intensive information and education campaigns to its consumers. All electric power industry participants are required to support the program aimed at reducing peak demand.

With the enactment of the EEC Act in 2019 and issuance of its implementing rules and regulations (Department Circular No. DC2019-11-0014) in the same year, development and implementation of DSM have been underlined as the responsibility of DOE with assistance of ERC and the Philippine Economic Zone Authority (PEZA). However, there are still many challenges to DSM implementation, which include limited availability and high cost of EE appliances and equipment, financing constraints, lack of expertise in DSM planning, implementation and evaluation, and lack of customer awareness.

The enactment of the EEC Act is another major step forward for the Philippine Government and DOE for DSM; however, it is critical that comprehensive, clear, and appropriate strategies and plans are developed to accelerate implementation and build investor confidence in EE and DSM.

Rationale for DSM

DSM is a requirement under the EEC Act. The EEC Act states that DSM programs for the electric power industry would be pursued through load management and other measures implemented by DUs to encourage end-users to manage their loads in an efficient manner. The development of a sound policy and regulatory framework would guide the implementation of DSM programs, including EE and RE, addressing the potential to contribute to meeting the significant peak demand forecast to 2040 and beyond in the Philippine Energy Plan (PEP). DSM is a strategic approach that promotes DU and consumer demand-side actions that not only address immediate challenges related to grid efficiency and reliability but also aligns with long-term national goals of sustainability, efficiency, and cost-effectiveness, and contributes to meeting the nation's commitment to UN's Sustainable Development Goals (SDG) goals and the Paris Climate Agreement. The rationale for implementing DSM is grounded in several key objectives and benefits:

- Reduction in peak demand and related need for new peak power plants

- Deferring power system investments
- Efficiency Improvement
- Reduced emissions
- Contribution to improved grid reliability and stability
- Facilitation of RE integration
- Consumer engagement
- Contribution to national targets

Design, Implementation and Financing Framework for DSM Policy and Programs

The proposed framework for DSM policy and programs is designed with the vision to support the creation of a resilient, reliable, efficient, clean, and affordable electricity system. Achievements of the economic, social, and technological goals will be delivered by meeting load profile objectives through strategic conservation, load management, and DR options. The key interventions to realize this vision include:

- Reduced energy consumption through enhanced efficiency in the domestic, commercial, industrial, public and municipal sectors.
- Strategic load management through permanent load shifting (PLS) using Time-Of-Use (TOU) tariffs.
- Active load management in the form of DR to balance the supply-demand gaps and to integrate higher levels of RE.

The design and implementation of DSM programs will be based on the following principles:

- Data driven targets-setting through load research.
- Smart meters as an enabler.
- Mass-market EE appliances deployment through financing intermediation.
- Alignment of PLS and DR in the power markets.
- PLS and Active Load Management/ DR to be integrated in the renewable energy integration options.
- Practical cost recovery mechanisms for utility-specific DSM activities.

Implementation of DSM policy and programs involves multiple stakeholders. DOE, as the primary entity for DSM under the EEC Act, will collaborate with ERC, IEMOP, NEA, PEZA and other key stakeholders to launch, set targets, implement, and evaluate the DSM policy and programs. It is anticipated that a diverse range of DSM programs, varying in scale, will be concurrently implemented by DUs across the country under supervision of ERC, NEA and other entities. Therefore, it is crucial for DOE to set up pertinent working committees that can facilitate seamless communication and information exchange among these stakeholders. The working committees can play a vital role in ensuring that DSM programs that will collectively contribute to the national level DSM goals are given priority, and also maintain the integrity of the DSM program evaluation. At a minimum, a DSM Facilitation Committee and a DSM Program Monitoring & Evaluation Committee should be established.

International experience suggests that the cost recovery mechanism through a tariff pass-through is a well-established mechanism and this mechanism is also feasible in the Philippines subject to

ERC's review and approval. Incentives shall also be provided to encourage DUs to invest in DSM programs, for example, a concessional loan program for DUs to promote adoption of EE appliances among residential consumers. In terms of funds that could be utilized to support DUs in the development and implementation of DSM programs, the Reinvestment Fund for Sustainable Capital Expenditures (RFSC), which is envisioned to fund the expansion, rehabilitation or upgrading of their existing electric power system in accordance with the ERC-approved CAPEX plan of ECs, could be eligible to finance DSM development and implementation by ECs.

Proposed DSM Programs

The system load profiles in the Philippines demonstrate three salient peak periods, i.e., morning peak at 11.00am, afternoon peak at 2.00pm and evening peak at 7.00pm. The Luzon grid is the main contributor, accounting for about 70% of the overall system peak demand. While the Visayas and Mindanao grids equally contribute to the overall system peak demand with 15% share each. Analysis of the DU data reveals that most large DUs in the Philippines have afternoon peaks, while smaller DUs tend to have the evening peak demand profiles. The Power Supply Procurement Plan (PSPP) reports provide some information on generation dispatching during the afternoon peak period in each region and it is found that peaking power generation across the three regional grid is dominated by fossil fuel power plants, except for the Luzon grid where RE power plants (solar and geothermal) are designated as the peaking plants.

Based on the framework for DSM policy and programs, the initial DSM programs are proposed in the table below. These programs are presented as generic representations of the DSM strategy, allowing for a more detailed analysis to be conducted by DUs, with guidance and support from DOE. The detailed analysis will facilitate a systematic program implementation rollout by individual and a cluster of DUs.

No.	Title & Description	Targeted Peak Demand	DSM Objective
1	**Water Pumping Load Management Program** – Staggering of pumping loads based on the generation profiles of solar plants	Late morning and afternoon peak	Load Shifting and Conservation
2	**Commercial Cooling Load Management Program** – Matching peak solar generation and air-conditioning load in the commercial sector, and working with commercial consumers to pilot the program	Late morning and afternoon peak	Load Shifting and Conservation
3	**EE Public and Street Lighting Program** – Identifying appropriate lighting and control technologies that cost effectively reducing peak demand reduction and energy consumption	Evening peak	Conservation

No.	Title & Description	Targeted Peak Demand	DSM Objective
4	**EE Appliance Program** – Promoting energy efficient appliances certified by PELP through incentives and financial mechanisms	All through the day	Conservation
5	**Efficient Motors and Motors-Driven systems program** – Promoting replacement of inefficient motors and motor-driven systems in the textiles, food processing and machining industry	All through the day	Conservation
6	**Efficient Cold-chains Chillers Program** – Promoting efficient use of chillers in the supermarkets and food warehouses	All through the day	Conservation
7	**Consumer EE&C Awareness Program** – Enhancing EE&C awareness of consumers and promoting EE&C behavior.	All through the day	Conservation
8	**DSM Load and Market Research Program** – Determining the shape of a DU's system profile and consumers' behaviors to form the basis for setting DSM objectives	All through the day	To be determined by the results of the load and market research

It should be noted that the last DSM program option (No. 8) is crucial for DUs where operations/performance of "end-uses" and behaviors of "end-users" are not yet well understood. The abovementioned DSM program options shall also be carried out in conjunction with the ongoing DOE's efforts on the Philippine Energy Labeling Program (PELP) for household appliances and public awareness programs on EE&C.

2 DEFINITIONS

Building Energy Management System (BEMS) / Home Energy Management Systems or HEMS – refers to a computer-based control system installed in houses or buildings that controls and monitors mechanical and electrical equipment such as air-conditioning and ventilation, lighting, water heaters, pumps, other power consuming equipment, fire protection and security systems, among others. Dwellings or Buildings with HEMS/BEMS installed in its premises are generally considered as Smart Homes / Buildings.

Demand-side Management (DSM) – refers to measures undertaken by distribution utilities o encourage end-users in the proper management of their load to achieve efficiency in the utilization of fixed infrastructures in the system[1]. In this DSM Program Report, DSM also refers to plans, programs, and technologies that encourage consumers to optimize their energy use.

Demand-side Measure – refers to any device and technology installed at the target end-user's premises or a utility's energy delivery system instituted for energy efficiency or energy management purposes for a specific DSM program.

DSM Optimization – refers to the process of selection and evaluation to identify DSM options that can achieve the maximum cost-effectiveness.

Demand Response (DR)[2] – refers to a mechanism in which the utility can, for a just cause, curtail the load at customer premises or disconnect certain equipment of the customer remotely from the utility's control center. Customer participation for DR program may be sought through incentives and penalties.

Demand Response Management System (DRMS) – refers to a software platform that allows a utility to manage all aspects of their DR programs through a single, integrated system.

Distributed Energy Resources (DER) – refers to smaller power sources that could be aggregated to provide power necessary to meet regular demand.

Distribution Management System (DMS) – refers to a collection of software applications designed to monitor and control the entire distribution network efficiently and reliably.

Distribution Automation (DA) – refers to an integrated system that enables an electric utility to automate and remotely monitor, control and coordinate all the distribution components installed in their franchise area.

Distribution Utility (DU) – refers to any electric cooperative, private corporation, government owned utility, or existing local government unit (LGU) which has an exclusive franchise to operate a distribution system including those whose franchise covers economic zones.

Conventional Meter – refers to an electronic or mechanical energy-measuring device without any communication capability.

[1] Source: Electric Power Industry Reform Act of 2001 (EPIRA), Republic Act No. 9136

[2] Source: https://www.doe.gov.ph/sites/default/files/pdf/issuances/dc2020-02-0003.pdf

Energy Conservation – refers to the reduction of losses and wastage in various energy stages from energy production to energy consumption through the adoption of appropriate measures that are technologically feasible, economically sound, environmentally-friendly, and socially affordable.

Energy Efficiency – refers to the way of managing and restraining the growth in energy consumption resulting in the delivery of more services for the same energy input or the same services for less energy input.

Energy Management System (EMS) – refers to a set of computer-aided tools that is capable of monitoring, controlling, and optimizing the operation of geographically dispersed generation and transmission assets in real-time.

Energy Storage System (ESS) – refers to a facility acting as a load and a generator, which is designed to receive, store and convert such energy to electricity.

Flexible Generation – refers to a power generating facility with fast ramping / fast start-up and shutdown capabilities connected directly to the transmission or distribution system that helps manage fluctuations in supply and addresses the intermittency of increasing variable renewable energy power plants.

Government Energy Management Program (GEMP) – refers to the government-wide program to reduce the government's monthly consumption of electricity and petroleum products through electricity efficiency and conservation, and efficiency and conservation in fuel use of government vehicles, among others.

Integrated Resource Planning (IRP) – refers to a comprehensive process through which utilities identify and acquire the most cost-effective electric resources necessary to meet their customers' requirements for energy and power.

Interruptible Load Program (ILP) – refers to a program between distribution utilities, retail electricity suppliers, and end-users wherein the latter are requested to use their own generating facilities or to reduce their electricity consumption during instances of power supply deficit. The National Grid Corporation of the Philippines (NGCP) can also implement ILP with its end-users, ecozones, and distribution utilities that are not yet implementing ILP in their respective franchise areas.

Load Shape – refers to the curve that represents load as a function of time.

Micro-Grid System – refers to a group of interconnected loads and a generation facility or DPG with clearly defined electrical boundaries that acts as an integrated power generation and distribution system, whether or not connected to a distribution or transmission system.[3]

Net Metering – refers to a system, appropriate for distributed generation, in which a distribution grid user has a two-way connection to the grid and is only charged for his net electricity consumption and is credited for any overall contribution to the electricity grid.

[3] Source: Microgrid Systems Act, Republic Act No. 11646

Peak Load Management – refers to plans, programs, and technologies that allow distribution utilities to manage its customer demand during peak hours.

Smart Grid – refers to a modernized electrical grid that utilizes innovative technologies with two-way and/or multi-way communication technologies, real-time monitoring and control systems to: 1) Improve overall reliability, power quality, security, efficiency and management of the electricity grid with full cybersecurity and interoperability; 2) Allow suitable integration of bulk and flexible generation, distributed energy resources, micro-grids, and electric vehicles with management systems; and 3) Empower customers with the provision of timely information and control options through enhanced energy management systems.

Smart Meter – refers to an electronic real-time energy-measuring device that is capable of remote connect/disconnect switching, outage and tamper detection, and has a two-way communication between the meter and the utility. A smart meter records consumption of electric energy in intervals of an hour or less and communicates that information back to the utility for monitoring and billing.

Virtual Power Plant (VPP) – refers to a network of aggregated decentralized, medium-scale power generating units such as, but not limited to, Combined Heat and Power (CHP) units, wind farms, solar PVs, flexible power consumers/prosumers and energy storage systems. The interconnected units will be dispatched through the central control room of the VPP. These VPPs aim to relieve the load on the grid by intuitively distributing the aggregated power generated by the individual units.

3 INTRODUCTION

The Southeast Asia ETP brings together governments and philanthropies to work with partner countries in the region - to contribute to the achievement of the UN's Sustainable Development Goals (SDGs) and the objectives of the Paris Climate Agreement. ETP supports the transition towards modern energy systems that can simultaneously ensure economic growth, energy security, and environmental sustainability. ETP's strategy is built around four inter-related pillars of strategic engagement that are squarely aligned to address the barriers to energy transition. These are (i) policy alignment with climate commitments, (ii) de-risking EE and RE investments, (iii) extending smart grids, and (iv) expanding knowledge and awareness building.

In this TA under the ETP, the DOE will establish a DSM program for the electric power industry for developing and implementing a range of strategies and actions that influence end-users to reduce electricity consumption, shift load patterns, and reduce peak demand. DSM will increase the efficiency of the distribution grid, enhance system flexibility and reliability, and delay the need for constructing additional power plants. The TA will strengthen the implementation of the DSM program and its institutional framework by delivering capacity building and developing a DSM toolkit. The combined impact of reduced electricity consumption and increased penetration of renewables in the grid will result in displacement of fossil-fuel based power generation and significant GHG emissions reduction.

3.1 Overview of the Power Industry

The large population and rapidly growing economy continue to drive the energy demand in the Philippines. Fossil fuels (coal, oil, and natural gas) currently supply around 83% of the country's electricity needs, while indigenous resources such as geothermal and biomass are not fully utilized primarily due to lack of investment. The energy self-sufficiency ratio[4] remains around 50%[5], showing gaps in the country's ability to fulfill its energy needs.

With its abundant renewable energy (RE) sources (hydro, geothermal, solar, biomass, wind), there is a drive to transition to sustainable energy. In 2022, the total renewable power generation capacity was 8.26 GW (29.2% of total generation capacity) and the total gross power generation by various types of renewable plants was 24,684 GWh, accounting for about 22% of the total gross generation. The shares of renewable power generation in the Philippines over the past three years have been relatively constant with a small variation between 21% to 22%. It should be noted that the National Renewable Energy Program (NREP) 2020-2040 sets a target of at least 35% RE share in the power generation mix by 2030 and aspires to increase it to at least 50% by 2040. The national electrification rate as of June 2023 was around 91%[6].

[4] Energy self-sufficiency is defined as the ability of a country or region to fulfill its own energy needs. It is calculated as production over the total primary energy supply (TPES).

[5] Source: Key Energy Statistics 2021, Energy Policy and Planning Bureau (EPPB), Policy Formulation and Research Division (PFRD), Department of Energy, the Philippines

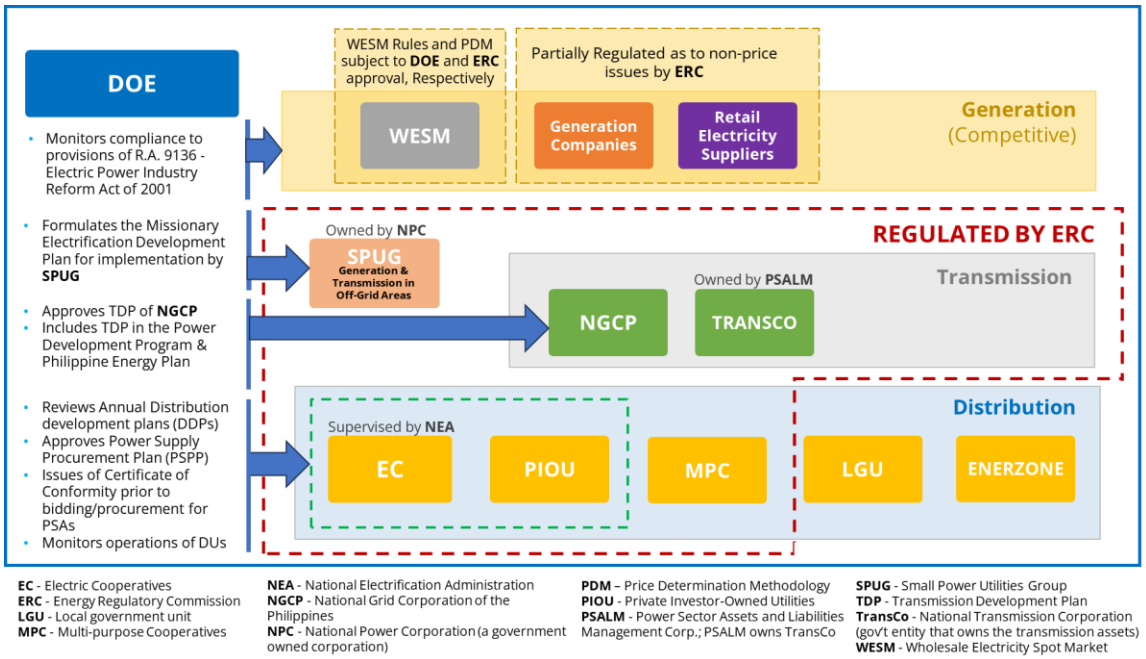
[6] Source: 2023-2032 National Total Electrification Roadmap, Department of Energy, the Philippines

The Electric Power Industry Reform Act 2001 (EPIRA) governs the electricity sector in the Philippines with generation, transmission and distribution being transferred to the private sector in order to liberalize and unbundle the power sector and promote competition.

The Philippines, being archipelagic, is characterized by an electricity network that is divided into grid and off-grid. Luzon, Visayas, and Mindanao represent the three (3) main grids which are partially interconnected. Luzon and Visayas have had an interconnected grid since 1998. According to the Electric Power Industry Management Bureau (EPIMB), the interconnection between Mindanao and Visayas through the Mindanao-Visayas Interconnection Project (MVIP) is still under the testing and commissioning phase. The Philippines have deregulated their electricity sector. The IEMOP, a non-stock, non-profit corporation, serves as the market operator of the WESM. The main grid's transmission system remains a government asset and is owned by the National Transmission Corporation (TransCo). The NGCP operates and maintains the transmission system through a concession agreement. Delivery of electricity to the end-users is the responsibility of the distribution sector.

The electricity distribution system includes 148 DUs[7], comprising of PIOUs, ECs, Enerzones and LGUs; each operating in a designated franchise area. There are 19 PIOUs accounting for 73% of the electricity sales with Meralco accounting for 57% of the sales. Meralco's franchise areas include Metro Manila, covering the whole of the National Capital Region and Mega Manila. The other DUs include 121 ECs, 5 Enerzones, 2 LGUs, and 1 multi-purpose cooperative (MPC). All DUs operate under the regulatory authority of the ERC.

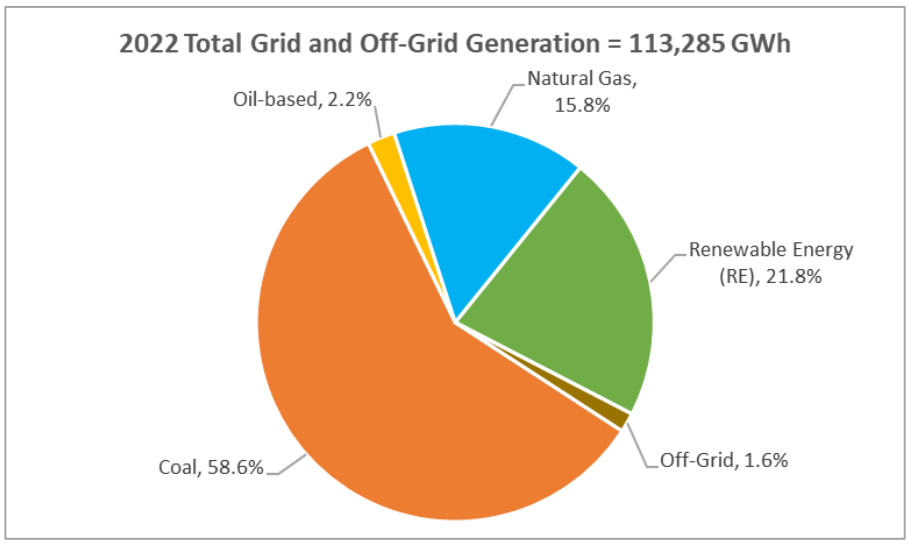
The structure of the power industry in the Philippines is shown in **Figure 3-1** which highlights key stakeholders in generation, transmission, and distribution of electricity in the country.



[7] Of 152 DUs listed on the DOE website, 3 LGUs in Luzon were integrated with Romblon Electric Cooperative, Inc. (ROMELCO) and 1 MPC in Visayas was integrated with Eastern Samar Electric Cooperative, Inc. (ESAMELCO).

Figure 3-1: Structure of the Philippine Power Industry and Role of Key Stakeholders

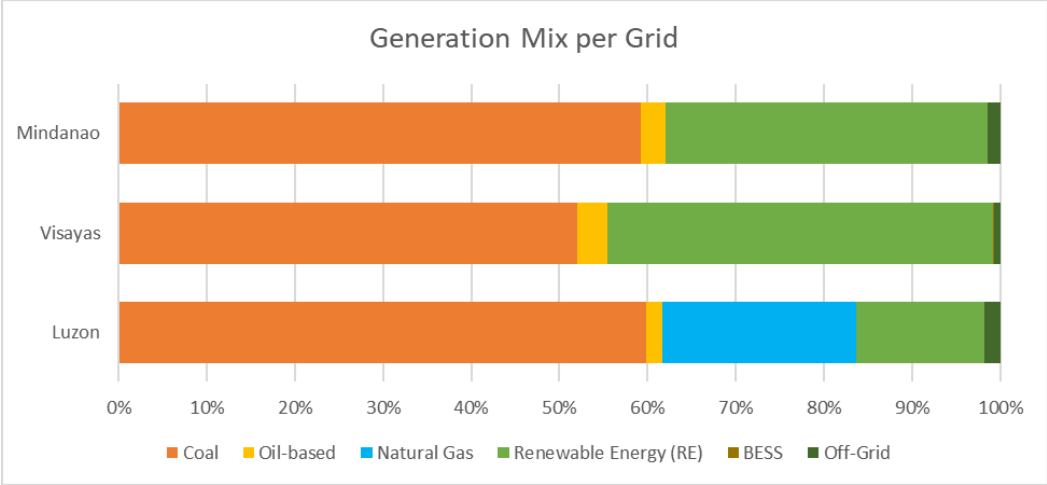
In 2022, the total grid installed capacity was 28,258 MW with a gross generation of 111,516 GWh. Coal accounted for around 60% of the grid power generation mix, the remaining contributors being RE (22%), natural gas (16%), and oil (2%). Additionally, the total generation for off-grid systems (mini-grids) across Luzon, Visayas, and Mindanao was 1,769 GWh and. this leads to the total grid and off-grid generation of 113,285 GWh in 2022. It should be noted that the electricity supplied through the Battery Energy Storage System (BESS) in 2022 was 21 GWh, however, DOE does not consider BESS as part of electricity generation. Shown in the **Figure 3-2** are shares of 2022 grid and off-grid generation by technology in the Philippines. Note that geothermal and hydro are the two main RE sources for electricity generation in the Philippines, accounting for about 18% of grid electricity generation.



Source: https://www.doe.gov.ph/energy-statistics/philippine-power-statistics

Figure 3-2: Shares of Grid and Off-grid Generation by Technology in the Philippines, 2022

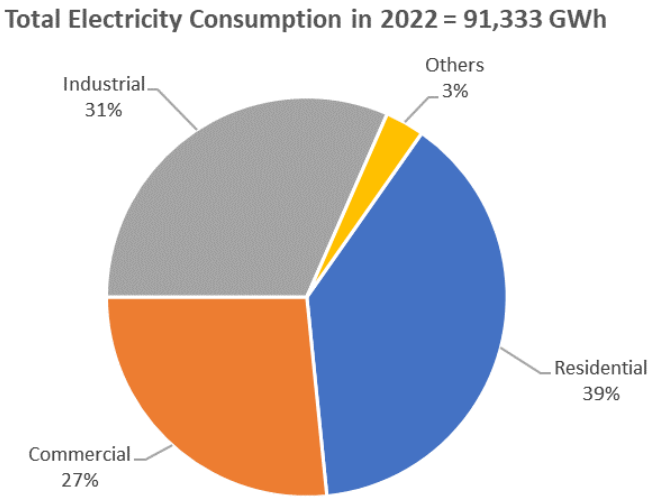
The Luzon grid is the largest grid and the generation in Luzon accounted for about 72% of the nationwide electricity generation in 2022. The generation in Visayas and Mindanao held similar shares of about 14%. As mentioned earlier, coal is predominant in all grids and natural gas power generation only exists in the Luzon grid.



Source: https://www.doe.gov.ph/energy-statistics/philippine-power-statistics

Figure 3-3: Shares of Generation Mix Per Grid in the Philippines, 2022

The recorded system peak demand was 16,596 MW in 2022 indicating an increase of 3.5% from the previous year of 16,036 MW. In terms of electricity sales in 2022, the residential and industrial sectors were the largest end-use sectors accounting for 39% and 31% of the 91,333 GWh of total electricity sales, respectively; the commercial sector consumption accounted for 27% and others 3% of total.



Source: https://www.doe.gov.ph/energy-statistics/philippine-power-statistics

Figure 3-4: Shares of Electricity Consumption by End-Use Sector, 2022

3.2 Status and Challenges of DSM Implementation

In 1994, United States Agency for International Development (USAID) provided support to the Philippine DOE to conduct a "DSM/IRP Pre-Assessment" to evaluate the status of the Philippine

energy sector and make recommendations for DOE to pursue DSM and IRP. The DSM Action Plan developed under this initiative included a three-phase program over a nine-year period[8]. The first Phase included the conduct of market research, end-use load research, and other customer data collection over the initial two years; conduct of pilot programs was included in the next phase; and followed by full scale implementation in the third phase. The estimated budget for these activities was USD 2.0m (phase 1), USD 10.7m (phase 2) and USD 84.0m (phase 3). There is no record of any follow up activities from this program.

Following the issuance of Department Circular No. 95-08-007 on the implementation of DSM by electric utilities, the DOE and the ERB[9], together with the members of the National DSM Working Group, developed a national DSM policy and regulatory framework entitled "A Framework for Demand-Side Management in the Philippines". It is aimed at the electric utilities' activities designed to encourage and influence their customers' use of electricity in ways that will produce desired changes to both the timing and level of electricity demand or load shapes. After conducting nationwide public consultations for over one year, the ERB promulgated and adopted the framework in December 1996[10]. Under the framework, each distribution utility was required to submit a DSM Plan within one year from the effective date.

The enactment of Republic Act (R.A.) No. 9136 or EPIRA of 2001 abolished ERB and created the ERC. As per Section 43 of the EPIRA, it is the ERC's duty to "promote competition, encourage market development, ensure customer choice and penalize abuse of market power in the restructured electricity industry." EPIRA provides the principal regulatory framework for the Philippine power industry in transitioning from a largely state-operated model to a market-oriented model.

In a deregulated market environment, regulators still play a major role in promoting DSM through price signals and incentives. In 2014, DOE issued the Department Circular No. DC2014-08-0014 enjoining all electricity consuming sectors particularly residential, industrial, commercial establishments including public facilities, operators of advertising bill boards, and all other electricity end-users, to implement DSM programs and other energy conservation measures to reduce the country's demand for supply of electricity. However, implementation of DSM programs has not been consistent across the DU with some adopting DR and interruptible load concepts, as described below.

At times of high electricity demand, utilities have traditionally leveraged peaking power plants to increase power generation to meet requirements. DR works from the other side of the equation – instead of adding more generation to the system, it pays energy users to reduce consumption. Utilities pay for DR capacity because it is typically cheaper and easier to procure than incremental peak generation. DR provides system and local reliability benefits by enabling utilities to avoid the use of rolling brownouts when there is not enough generation to satisfy demand. DR allows energy users of all kinds to act as "Virtual Power Plants (VPP)", adding stability to the grid by voluntarily

[8] Source: Demand-Side Management Action Plan for the Philippines, USAID, July 1994

[9] ERB was created under Executive Order No. 172 in 1987 and had the authority to regulate power rates and services of private electric utilities.

[10] Source: The Energy Efficiency and Demand-Side Management Programs as implemented by the Energy Efficiency Division of the Department of Energy, Jesus C. Anunciacion, Chief, Energy Efficiency Division, Department of Energy

lowering their demand for electricity. Participants in DR programs get paid for providing DR capacity, which avoids the need for utilities to find additional generation capacity at a higher cost.

In 2010 the Philippines Government instituted the ILP[11], which recognized the important role that demand response can play in times of constrained supply, as was expected to persist in Luzon between 2015-2018. This program called for the voluntary enlistment of large corporations and government owned enterprises that have backup generation capacity, with the aim of providing a means for covering an expected 700 MW shortfall in generation capacity during this period. The ILP encourages large electricity consumers to run their own generator sets to ease demand from the grid and, in exchange, they are compensated for using their own power. MERALCO, the largest DU in the Philippines, has reported that, as of September 2022, 121 companies have enrolled in their ILP with a cumulative peak demand reduction capacity of 582 MW.

In the medium term, there is need for a comprehensive EE strategy for the power sector, which incorporates both the DR activities and regulatory oversight of DUs, as well as building a culture of EE throughout the electricity generation, transmission and distribution system as well as electricity consumers, and establishing rules and regulatory arrangements that are supporting of EE activity by DU.

The Energy Efficiency and Conservation Roadmap (2023 – 2050)[12] has proposed the development of a DSM Policy and Strategy for program development to be undertaken in the Medium Term (2026 – 2030) in compliance with Section 70 of DC2019-11-0014, entitled "Implementing Rules and Regulations of Republic Act No. 11285" [13]. The strategy is to include best practices in DSM covering all key sectors (industry, commercial, residential) and including effective load management, load shifting from peak to off-peak and use of EE technologies and systems.

There are many challenges to DSM implementation, which include limited availability and high cost of EE appliances and equipment, financing constraints, lack of expertise in DSM planning, implementation and evaluation, and lack of customer awareness. There are several actions undertaken by the Government of the Philippines, especially through the Government Energy Management Program (GEMP)[14]. The DOE's call for energy efficiency and conservation to be a way of life was realized with the passage of the Energy Efficiency and Conservation Act. This Act contains provisions (e.g., Minimum Energy Performance and mandatory energy labeling for electrical appliances) that are for the benefit of consumers.

Summarized in the table below are mapping of active regulatory frameworks and guidelines related to DSM in the Philippines following the enactment of EPIRA. More details on these DSM related initiatives are discussed in the subsequent sections of this report.

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[11] ERC issued a Resolution No. 08, Series of 2010 adopting rules to govern the Interruptible Load Program (ILP) of Distribution Utilities (DUs) in March 2010. The formula for billing and compensation was amended in May 2014 by the Resolution No. 08 Series of 2013. In 2015, the amended rules to govern ILP was published in the Resolution No. 05, Series of 2015.

[12] Source: https://www.doe.gov.ph/sites/default/files/pdf/announcements/Draft%20Roadmap%20for%20Posting_2023.pdf

[13] Source: https://www.doe.gov.ph/sites/default/files/pdf/issuances/dc2019-11-0014-updated.PDF, page 22

[14] Source: https://www.officialgazette.gov.ph/downloads/2019/04apr/20190412-RA-11285-RRD.pdf, Section 4 (t), page 6

Table 3-1: Active Regulatory Frameworks related to DSM in the Philippines

No.	Title	Relevance to DSM	Implementation Status (As of April 2024)
1	Resolution adopting the rules to govern the implementation of the time of use (TOU) retail rates of distribution utilities (ERC Resolution No. 01, Series of 2008 and No. 05, Series of 2009)	TOU is an effective DSM mechanism enabling DUs to shift the electricity loads through pricing signals. Participation in the TOU scheme is voluntary and the customer shall bear the costs of the metering equipment and its accessories.	MERALCO has offered the TOU scheme for its customers since 2007. MERALCO's TOU scheme was revised in 2009 reducing the threshold from 750 kW to 5 kW for industrial/ commercial customers and from 2,000 kWh to 500 kWh in monthly consumption for residential customers.
2	Resolution adopting the rules to govern the interruptible load program (ILP) of distribution utilities (ERC Resolution No. 08, Series of 2010, No. 08, Series of 2013 and No. 05 of Series 2015)	ILP is a voluntary demand response program with the DSM objective on "peak clipping". ILP allows DUs to agree with the participating consumers to partially or fully de-load during an expected power shortage as notified by the system operator.	
3	Providing a national smart grid policy framework for the Philippine electric power industry and roadmap for distribution utilities (DC 2020-02-0003)	The smart grid (SG) is relevant to DSM in many aspects, including but not necessarily limited to reliability, efficiency, flexibility/ sustainability, resiliency and consumer empowerment.	
4	Prescribing the guidelines of the Philippine Energy Labeling Program (PELP) for compliance of importers, manufacturers, distributors and dealers of electrical appliances and other energy-consuming products (ECP) (DC 2020-06-0015)	PELP directly promotes penetration of more efficient appliances and lighting products in buildings and it directly contributes to the DSM objectives on "strategic conservation" and "peak clipping".	
5	Prescribing the policies to enhance the net-metering program for renewable energy systems (DC 2020-10-0022)	The net-metering program promotes installation of on-site renewable energy systems, including rooftop solar PV systems, within the	

No.	Title	Relevance to DSM	Implementation Status (As of April 2024)
		end-users' premises. Properly coordinated on-site renewable energy systems can significantly reduce daytime peak demands of DUs.	
6	Adoption of the guidelines on energy conserving design of buildings (DC 2020-12-0026)	The guidelines on energy conserving design of buildings (2020 edition) provides guidelines and minimum requirements for the energy conserving designs of new and existing large buildings with at least 112.5 kVA of total connected electrical loads or having at least 10,000 square meters. It directly contribution the DSM objective on "strategic conservation".	
7	Prescribing the policy and guidelines for the formulation of distribution utilities distribution development plan integrating the relevant laws, policy issuances, and rules and regulations (DC 2021-03-0003)	DUs and other entities are mandated to prepare and submit the annual Distribution Development Plans (DDPs) in which the pursuance of a DSM shall be considered.	
8	Guidelines for the endorsement of energy efficiency projects to the Board of Investments for fiscal incentives (DC 2021-05-0011)	Qualified energy efficiency projects can receive fiscal incentives which improve the return on investment of the projects.	
9	Resolution adopting the rules governing distributed energy resources (ERC Resolution No. 11, Series of 2022)	Distributed energy resources (DERs) are relevant to DSM in many aspects. Properly coordinated DER can significantly reduce energy consumption and peak demands of DUs.	
10	Government Energy Management Program (GEMP) Guidelines, IAEECC Resolution No. 5,	GEMP directly contributes to the DSM objective on "strategic conservation".	

No.	Title	Relevance to DSM	Implementation Status (As of April 2024)
	s. 2022		
11	Encouraging all government entities (GES) to install and utilize solar photovoltaic (PV) system or any equivalent renewable energy technologies in their government-owned facilities and/or office buildings in a form of self-generating facility, distributed energy resources (DER), or net metering agreement with host distribution utility (DU), IAEECC Resolution No. 8, s. 2023	GEMP directly contributes to the DSM objectives on "peak clipping" and "strategic conservation".	
12	Prescribing the policy for energy storage system in the electric power industry (DC 2023-04-0008)	Energy storage systems (ESS) can be used to manage end-use energy requirements which support the DSM objective on "load shifting".	
13	Prescribing the policy for the mandatory conduct of the competitive selection process by the DUs for the procurement of power supply (DC 2023-06-0021)	The principles of power supply procurement by DUs are provided. A DU has an obligation to supply its Captive Market in the least cost manner, taking into consideration the quality, affordability, sustainability and reliability of the electric power supply, in accordance with DDP and Power Supply and Procurement Plan (PSPP). DSM can be considered as one of the supply options.	

3.3 Rationale for Demand Side Management

According to the current Philippine Energy Plan (PEP) for 2023 – 2050, the country's peak demand is expected to increase by almost four-folds over the next 20 years, from 15.3 GW in 2020 to 54.7 GW in 2040. The corresponding required installed generation capacity is expected to increase from 26.2 GW to 95.7 GW in 2040. The increase needs to be met by existing, committed and planned resources. An important resource that can contribute significantly to meeting the needed

increase in peak demand is demand-side management. Implementation of an effective DSM program has the potential for slowing the increase in peak demand, facilitating RE integration in the electricity grid, and reducing capital expenditures for power plants based on imported fossil fuel and the associated environmental impacts.

The rationale for implementing DSM is grounded in several key objectives and benefits:

- **Reduction in peak demand and related need for new peak power plants** - DSM helps in flattening the demand curve by reducing peak electricity consumption during high-demand periods. This can prevent the need for introducing peak power plants with high costs of generation, leading to cost savings and increased power system efficiency.
- **Deferring investments in transmission and distribution infrastructure** – By reducing and managing electricity demand, DSM defers the need for capital investments in transmission and distribution infrastructure. The reduced infrastructure investments lead to reduced electricity costs to consumers.
- **Efficiency Improvement** - DSM leads to more efficient use of energy by consumers and reduced energy waste, by implementing EE technologies, optimizing equipment usage, and adopting energy-saving behavior.
- **Reduced emissions** – DSM allows for optimization of energy consumption patterns, thereby reducing the need for power generation, particularly during peak demand periods when the generation technologies with the largest GHG footprints are likely to be utilized, thereby aligning with long-term GHG reduction goals.
- **Contribution to improved grid reliability and stability** – By managing and controlling the electricity demand profile, DSM contributes to the overall stability and reliability of the electrical system. This results in improved grid reliability and stability and reduced load curtailment, blackouts or brownouts during periods of high demand.
- **Facilitation of RE integration** – Many RE resources (such as solar and wind) provide variable amounts of power. DSM can help match electricity demand with the availability of RE resources, thereby facilitating its integration into the grid and improving the overall efficiency and sustainability of the electricity system.
- **Consumer engagement** – DSM encourages active participation and engagement from consumers in managing their energy consumption. This can lead to increased awareness, behavioral changes, and the development of an energy-efficient culture.
- **Contribution to national targets** – DSM contributes to meeting the national commitments and related targets related to the achievement of the UN's Sustainable Development Goals (SDGs) and the objectives of the Paris Climate Agreement.

In summary, DSM is a strategic approach that promotes utility and consumer demand-side actions that not only address immediate challenges related to grid efficiency and reliability but also aligns with long-term national goals of sustainability, efficiency, and cost-effectiveness, and contributes to meeting the nation's commitment to SDG goals and the Paris Climate Agreement.

4 DSM RELATED POLICY AND LEGISLATION

4.1 EEC Act (R.A. No. 11285)

The EEC Act or Republic Act (R.A.) No. 11285, which took effect in April 2019, establishes a framework for introducing and institutionalizing fundamental policies on energy efficiency and conservation, including the promotion of efficient and judicious utilization of energy, increase in the utilization of energy efficiency and RE technologies, and the delineation of responsibilities among various government agencies and private entities.

DOE is designated as the lead agency in the implementation of this Act. It shall be responsible for the planning, formulation, development, implementation, enforcement, and monitoring of energy management policies and other related energy efficiency and conservation plans and programs. In addition to its existing mandate, DOE shall also have the following powers and functions:

a) Spearhead the creation and update the development of the National EEC Plan (NEECP) in coordination with pertinent government agencies, LGUs, and private corporations and organizations;
b) Develop a system of monitoring the implementation of the NEECP, including the targets that are established therein;
c) Develop and maintain the National EEC Database (NEECD), in coordination with and with the assistance of the Philippine Statistical Authority, to ensure efficient evaluation, analysis, and dissemination of data and information for enforcement, planning, and policy-making;
d) Lead the efforts to ensure compliance with the Government Energy Management Program (GEMP) in accordance with the strategic direction provided by the Inter-Agency EEC Committee (IAEECC), etc. Chapter V establishes the requirements for Minimum Energy Performance and Labelling Requirement

4.1.1 National EEC Plan

The National EEC Plan (NEECP) is a comprehensive framework and plan that institutionalizes energy efficiency and conservation in the country across key sectors of the economy in accordance with the EEC Act. Section 4(z) of the EEC Act stipulates that the NEECP shall set out the governance structure, and programs for energy efficiency and conservation with defined national targets, feasible strategies, and regular monitoring and evaluation. The plan is also required to be regularly reviewed and revised by DOE.

The National EEC Roadmap 2023-2050 provides an updated outline of the strategic plans and actions for EEC in the Philippines across all sectors. The NEECP Roadmap as it provides for the key programs for EEC by sector, for which emissions reduction targets and costings have been developed. Under the NEECP Roadmap, the sectoral targets for short-, medium- and long-term are provided for government, commercial, residential, industrial, transport, and utilities & end use. The DSM program is included as the strategic action for the medium-term (2025-2028).

4.1.2 Government Energy Management Program

The Government Energy Management Program (GEMP) is a government-wide program aiming to reduce the government's consumption of electricity and petroleum products in buildings, facilities and vehicles through EEC strategies, and utilization of RE technologies and systems, among others. The strategic direction for the GEMP's implementation is provided by IAEECC, and IAEECC Resolution No. 1. s.2020[15] directs all government agencies, LGUs, and foreign service posts to comply with GEMP.

GEMP has set out a minimum saving target of 10% each for electricity and petroleum products through a minimum implementation period of 3 years. Each government entity shall designate a senior official as its EEC Officer (ECO) who will be responsible for the development and implementation of EEC measures. DOE shall provide technical assistance to each government entity in conducting energy audits to determine priorities for EEC measures in its facilities[16]. DOE shall also conduct review and propose revisions to the existing 10% saving threshold, guidelines on the use of savings achieved by government entities as well as develop criteria for government EEP. These improvements are subject to the approval of IAEECC.

4.2 Renewable Energy Act (R.A. No. 9513)

The RE Act of 2008 or R.A. No. 9513, consisting of nine Chapters, establishes the framework for the accelerated development and advancement of RE resources, and the development of a strategic program to increase its utilization. It specifies the requirements to be satisfied in order to perform the abovementioned activity and establishes the REMB, entitled to:

a) Implement policies, plans and programs related to the accelerated development, transformation, utilization and commercialization of RE resources and technologies;
b) Develop and maintain a centralized, comprehensive and unified data and information base on RE resources to ensure the efficient evaluation, analysis, and dissemination of data and information on RE resources, development, utilization, demand and technology application;
c) Promote the commercialization/application of RE resources including new and emerging technologies for efficient and economical transformation, conversion, processing, marketing and distribution to end users;
d) Conduct technical research, socio-economic and environmental impact studies of RE projects for the development of sustainable RE systems;
e) Supervise and monitor activities of government and private companies and entities on RE resources development and utilization to ensure compliance with existing rules, regulations, guidelines and standards;

[15] Source: https://www.doe.gov.ph/sites/default/files/pdf/announcements/iaeecc-resolution-no-1-s2020.pdf

[16] Source: https://www.officialgazette.gov.ph/downloads/2004/10oct/20041025-AO-0110-GMA.pdf

f) Provide information, consultation and technical training and advisory services to developers, practitioners and entities involved in RE technology and develop RE technology development strategies.

4.2.1 National Renewable Energy Program

The National RE Program (NREP) sets the strategic building blocks that will help the country achieve the goals set forth in the RE Act of 2008. The NREP signals the country's big leap from fragmented and uncoordinated RE initiatives into a focused and sustained drive towards energy security and improved access to clean energy. The NREP lays down the foundation for developing the country's RE resources, stimulating investments in the RE sector, developing technologies, and providing the impetus for national and local RE planning that will help identify the most feasible and least-cost RE development options. The NREP proceeds from the assumption that certain activities can be implemented right away; while others will take some time to implement.

4.3 Department Circulars

DSM related Department Circulars (DCs) approved by DOE are summarized in this section. As discussed in Section 3.2, the enactment of EPIRA abolished ERB and created ERC. Considering this, any DCs involving ERB, such as DC 1995-08-007 - Instituting Demand Side Management by Electric Utilities[17] are not included in this section.

4.3.1 Enjoining all Electricity Consuming Sectors to Implement DSM Program and Other Energy Conservation Measures (DC 2014-08-0014)

This circular directs all electricity consuming sectors, particularly residential, industrial, commercial establishments, including public facilities and all other electricity end-use sectors to implement DSM programs and energy conservation measures to reduce electricity demand; and ensuring that vital infrastructure facilities (hospitals, military installations, airports etc.) maintain their regular use for reliability and adequate power supply.

DOE's Energy Utilization Management Bureau (EUMB) shall develop and implement DSM programs and projects nationwide including a system of incentives and penalties for the same

[17] This circular directs all electric utilities to consider alternative methods of future demand for electric service. DUs are enjoined to develop and submit a demand side management plan periodically every 2 years to the Energy Regulatory Board (ERB) for review and approval beginning in 1996. ERB is required to develop and implement a regulatory framework to enjoin DUs to invest in DSM projects. ERB shall also consider other rate making methodologies so that utilities are provided economic incentives for investing in DSM programs. Such DSM programs shall from time to time be appropriately monitored and evaluated by ERB. DOE has a responsibility to monitor and compile DSM efforts and activities for inclusion in the overall energy plan of the country.

after public consultation. All DUs are obligated to implement DSM programs and other energy conservation measures; and are required to undertake intensive information and education campaigns to its consumers. All electric power industry participants are required to support the program aimed at reducing peak demand.

4.3.2 Implementing Rules and Regulations of Republic Act No. 11285 (DC 2019-11-0014)

The aims of the "Implementing Rules and Regulations of the EEC Act" (EEC-IRR) are to: a) Institutionalize energy efficiency and conservation as a national way of life geared towards the efficient and judicious utilization of energy by formulating, developing, and implementing energy efficiency and conservation plans and programs; b) Promote and encourage the development and utilization of efficient renewable energy technologies and systems to ensure optimal use and sustainability of the country's energy resources; c) Reinforce related laws and other statutory provisions for a comprehensive approach to energy efficiency, conservation, sufficiency, and sustainability in the country; and d) Ensure a market-driven approach to energy efficiency, conservation, sufficiency, and sustainability in the country.

The EEC-IRR establishes a framework for introducing and institutionalizing fundamental policies on energy efficiency and conservation, including the promotion of efficient and judicious utilization of energy, increase in the utilization of energy efficiency and renewable energy technologies, and the delineation of responsibilities among various government agencies and private entities.

4.3.3 Providing a National Smart Grid Policy Framework for the Philippine Electric Power Industry and Roadmap for DUs (DC 2020-02-0003)

This circular outline the policies and roadmap for the development and implementation of Smart Grids in the country; and covers the supervision of the restructure of the power industry to ensure quality, reliability, security and affordability of electric power; and the criteria for the transition of the Philippine Power System into a Smart Grid by 2040.

4.3.4 Prescribing the Guidelines of the Philippine Energy Labeling Program (PELP) for Compliance of Importers, Manufacturers, Distributors and Dealers of Electrical Appliances and Other Energy-Consuming Products (ECP) (DC 2020-06-0015)

The circular on "Prescribing the Guidelines of the Philippine Energy Labeling Program (PELP) for Compliance of Importers, Manufacturers, Distributors and Dealers of Electrical Appliances and other Energy-Consuming Products (ECP)", approved on 15 June 2020, set the technical requirements for appliances and devices to meet a Minimum Energy Performance for Products

(MEPP) and established a system to inspect, monitor and verify the corresponding energy labels of ECPs. PELP is implemented jointly by the DOE's EUMB and the Department of Trade and Industry's Bureau of Product Standards, in collaboration with relevant industry associations.

The PELP Implementing Guidelines were also developed to cover the particular product requirements (PPR) and the Code of Practice on Energy Labelling (COPE) of ECPs. The guidelines outline registration procedures, enforcement, monitoring and verification processes, as well as serve as compliance mechanisms for manufacturers, importers, distributors, dealers and retailers of ECPs. The ECPs covered under the PELP implementing guideline include room air conditioners, refrigerators, televisions and lighting products such as lamps and ballasts.[18]

4.3.5 Adoption of the Guidelines on Energy Conserving Design of Buildings (DC 2020-12-0026)

This circular relates to making improvements to the Guidelines on Energy Conserving Designs on Building considering the advances in EE&C and RE technologies with the support of EUMB. In addition, EUMB shall coordinate with the Department of Public Works and Highways – National Building Code Development Office (DPWH-NBCDO) for the integration of Guidelines on Energy Conservation Designs of Buildings in the Philippine Green Building Code.

4.3.6 Prescribing the Policy and Guidelines for the Formulation of Distribution Utilities Distribution Development Plan Integrating the Relevant Laws, Policy Issuances, and Rules and Regulations (DC 2021-03-0003)

As specified in the EPIRA, DUs and ECs are required to prepare their annual Distribution Development Plans (DDPs) for submission to DOE. Note that EC's DDPs will be submitted to DOE through NEA. This Department Circular, approved in March 2021, provides the guidelines in the formulation of DDPs to ensure secure, reliable and efficient power service delivery to their customers and end-users at all times. The right decisions on upgrading power distribution infrastructures help ensure efficient use of resources and avoid unnecessary investments.

Other guiding principles include, but not limited to: institutionalization of a consultative process between DUs and the concerned Local Government Units (LGUs), relevant government agencies, the business sector and other mandated entities; and DDPs shall be responsive to all policy developments and integration of recent relevant laws, policies, rules and regulations governing the distribution system. The circular also provides the template for the DDP contents and the procedures for the preparation and submission of the DDPs.

[18] Source: https://enerhiyangatin.ph/program/02-philippine-energy-labelling-program.html, https://www.doe.gov.ph/pep , https://www.energytransitionpartnership.org/resource/diagnostic-analyses-report-of-energy-efficiency-development-in-the-philippines/

4.3.7 Guidelines for the Endorsement of Energy Efficiency Projects to the Board of Investments for Fiscal Incentives (DC 2021-05-0011)

Energy Efficiency Projects that will realize energy savings, as further defined under Section 9 of this Department Circular[19], may qualify for registration, and be entitled to the incentives provided for under R.A. 11534 or the Corporate Recovery and Tax Incentives for Enterprises (CREATE) Act. For the eligibility of fiscal incentives, DOE shall endorse energy efficiency projects that passed the technical and the economic evaluation criteria as provided in Section 9 of the Circular.

4.3.8 Prescribing the Policy for Energy Storage System in the Electric Power Industry (DC 2023-04-0008)

This Department Circular was approved in April 2023 to maximize the benefits of the Energy Storage Systems (ESS) in ensuring the quality, reliability, security, sustainability, and affordability of the supply of electric power, and in accelerating the exploration, development, and utilization of RE sources. The Circular provide the framework for operation of ESS for power industry participants (e.g., GENCOs, DUs and end-users) and it includes the compliance requirements with the EPIRA and its Implementing Rules and Regulations (IRR), Philippine Gird Code (PGC), Philippine Distribution Code (PDC), WESM Rules and its Market Manuals, Philippine Electrical Code and other pertinent issuances by DOE, ERC, and other relevant government instrumentalities having authority over the grid or the distribution system's reliability and supply security.

The Circular outlines the purposes of ESS for registration and provides the requirements pertaining to the connection and operation of ESS. ESS can be used to optimize energy usage, manage peak demand, enhance grid stability, support renewable integration, and provide flexibility and resilience to the overall energy system. The Circular highlights that ESS can support storing energy available during off-peak periods and discharging the stored energy in the power system during peak periods thereby reducing consumption from the grid during peak hours.

4.3.9 Prescribing the Policy for the Mandatory Conduct of the Competitive Selection Process by the DUs for the Procurement of Power Supply (DC 2023-06-0021)

This Department Circular, approved in June 2023, shall apply to any DU consistent with the mandate to supply electricity in the least cost manner subject to the collection of retail rate approved by ERC. All power supplied shall be procured through the Competitive Section Process

[19] https://www.doe.gov.ph/sites/default/files/pdf/issuances/dc2021-05-0011.pdf

(CSP), consistent with the latest and duly approved DDP and PSPP in which DSM could be considered as the viable supply options.

4.4 ERC Resolutions

4.4.1 Resolution Adopting the Rules to Govern the Implementation of the Time Of Use (TOU) Retail Rates of Distribution Utilities

The implementation of TOU tariffs of DUs in the Philippines is governed by two ERC's Resolutions, i.e., Resolution No. No. 01, Series of 2008 and No. 05, Series of 2009. These Resolutions enable DUs to implement their TOU retail rates to their customers and specify an approach for calculation of the TOU rates. The Resolutions also outline approaches for implementing TOU rates, including, but not limited to, the conduct of consumer education programs on benefits and/or disadvantages of the TOU rates by DUs, responsible parties for the costs of metering equipment and accessories and supply and metering charge, and the enrollment process and opting out procedure for customers. To date, only MERALCO has offered the TOU rates to its customers.

4.4.2 Resolution Adopting the Rules to Govern the Interruptible Load Program (ILP) of Distribution Utilities

The implementation of ILP by DUs in the Philippines is governed by ERC's Resolution No. 08, Series of 2010, No. 08, Series of 2013 and No. 05 of Series 2015. Resolution No. 08, Series of 2010 adopting rules to govern the ILP of DUs in March 2010. ILP incentivizes reduction in demand when the system reliability is jeopardized as notified by the system operator. ILP allows the DU and the participating customer to enter into an agreement wherein the customer may be required by its DU to be partially or fully de-loaded/disconnected for a period of time as determined by the DU. The DU shall pay the participating customer a de-loading compensation of the incremental cost incurred which shall be recovered from all customers of the DU as part of the monthly total power cost. The formula for billing and compensation was amended in May 2014 by the Resolution No. 08 Series of 2013. In 2015, the amended rules to govern ILP was published in the Resolution No. 05, Series of 2015.

As highlighted earlier, MERALCO has reported that, as of September 2022, 121 companies have enrolled in their ILP with a cumulative peak demand reduction capacity of 582 MW.

4.4.3 Resolution Adopting the Rules Governing Distributed Energy Resources (DER)

ERC's Resolution No. 11, Series of 2022 aims to encourage the development and development and utilization of DER, promote energy quality, reliability, security, affordability, and sustainability, with the end view of achieving the objectives of the EPIRA, RE Law, and other relevant laws, rules and regulations. The rules under this Resolution are only applicable to renewable DER for self-consumption and export. For on-grid DUs, the nameplate capacity shall be greater than 100kW up to 1MW. For off-grid DUs, the nameplate capacity shall not be more than 1MW. The maximum export capacity of DER shall not exceed 30% of the nameplate capacity. The DU shall compensate a renewable DER's exported energy based on the DU's monthly blended generation rate in relation to its renewable DER rated capacity. The Resolution also provides the pricing methodologies, interconnection standards, and reporting requirements.

5 SUMMARY OF INTERNATIONAL EXPERIENCE

5.1 Relevant Regulations in Other Countries

International experience suggests that strong legal, policy and regulatory frameworks with clear and unambiguous mandates that prioritize energy efficiency over other resources have had significant impact in driving electric utility DSM investments and programs. A survey by IEA in 2012 has found dozens of jurisdictions around the world with some form of energy efficiency obligations for DU. Typically, utility EE obligations implemented across the globe share the following features:

- A quantitative binding target for EE improvement;
- Target enforced by laws and regulations with the threat of financial penalties;
- Clear definition of obligated parties that must meet the target;
- A systematic process for compliance verification.

5.1.1 European Union

In the European Union (EU), article 7(6) of the EE Directive requires EU member countries to achieve energy saving targets. The EE Directive was first adopted in 2012, and it was updated in 2018 and 2023, setting rules and obligations for achieving the EU's ambitious EE targets[20]. The 2023 revised Directive raises the EU EE target, making it binding for EU countries to collectively ensure an additional 11.7% reduction in energy consumption by 2030, compared to the 2020 reference scenario projections. To comply with this Directive, many EU member countries have adopted a combination of legislative actions and regulatory mechanisms to enforce EE obligations on energy utilities. "EE obligations" is a regulatory mechanism that requires obligated parties to meet quantitative energy efficiency improvement targets in a predefined time frame. Typically, the obligation is placed on regulated energy utilities, who are in the business of distribution and retail sales of energy commodities. EE obligations for utilities require them to reduce the demand for energy by promotion of DSM.

5.1.2 India

In India, Utility DSM progress so far is primarily driven by institutional development, donor funded studies and pilots, market based investments facilitated by national institutions in the broader context of EEC, economic efficiency of retail tariffs, market recognition for DSM based Utility services, enhanced customer satisfaction, and other ad hoc competitive advantages for utilities, especially in the regulated electricity distribution markets in the states like Delhi, Maharashtra, Odisha and Karnataka.

By virtue of these market driven approaches, the DSM market has significantly evolved in India. On the policy front, DSM Regulations have been active in about 27 states and 7 Union Territories

[20] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ%3AJOL_2023_231_R_0001&qid=1695186598766

till date. These regulations provide a systematic approach for the entire DSM implementation cycle by clearly defining the roles and responsibilities for the key stakeholders. However, the enforcement of DSM regulations continues to be limited in many states. Given that the mass market / non-utility-specific DSM mechanisms have gained significant momentum in the recent times, India is at the crossroads for adopting the right policy approach that can effectively complement the market mechanisms in capturing the DSM potential and also delivering the promise of DSM.

5.1.2.1 Energy Conservation Act 2001 and Related Regulations

The Energy Conservation Act 2001 (EC Act) was enacted to set up the Bureau of Energy Efficiency (BEE) as a nodal agency with specific powers and functions to facilitate, regulate and promote energy efficiency in all sectors of the economy. The EC Act also provides multiple functions and statutory powers to the central and state governments to facilitate and enforce efficient use of energy and its conservation.

The EC Act is the governing framework for promoting energy efficiency and conservation in India. The Act has provided statutory basis to regulate energy consumption and enforce energy efficiency standards on buildings and end use energy consuming appliances/equipment. India successfully launched an Energy Savings Certificates (ESCerts) market by enforcing targets to reduce energy consumption per unit of production/output through a mechanism termed as the "Perform-Achieve-Trade" (PAT) mechanism imposed on "designated consumer".

The Perform, Achieve and Trade (PAT) scheme is most significant outcome of the EC Act. It is a regulatory instrument to reduce specific energy consumption in energy intensive industries (notified as designated consumers), through a market-based mechanism that facilitates certification and trading of excess energy savings to enhance the cost effectiveness of energy efficiency investments. In 2012, the Indian government through BEE notified specific energy consumption improvement targets over a three-year cycle (2012 – 2015) for 478 designated consumers (individual obligated entities) in eight energy intensive sectors, namely thermal power plants, aluminum, cement, chlor-alkali, fertilizer, iron and steel, pulp and paper, and textiles. These sectors represent 65% of India's total industrial energy consumption. In the current cycle of PAT implementation, more consumers are included as designated consumers; most significant addition being the distribution companies.

The EC Act does not provide explicit provisions for the promotion and implementation of DSM by electric utilities. The government included distribution companies (DISCOMs) as "designated consumers" under the EC Act 2001 and subsequently notified targets under the PAT scheme that are aligned with the loss reduction targets by the state electricity regulatory commissions. The mandate of a designated consumer under the EC Act and PAT scheme is to reduce one's own energy consumption or intensity within its operating boundary or facility. For distribution utilities, this means the electricity losses within the distribution network and not the electricity demand beyond the customer's meter. Moreover, the electricity regulatory commissions are already regulating the Aggregate Technical & Commercial (AT&C) losses and distribution losses under the governance framework provided by the Electricity Act 2003.

5.1.2.2 Renewable Energy Portfolio Obligations in India and Its Relevance to Demand-side Management

The Electricity Act (2003)[21] in India allows the Ministry of Power to develop tariff policy to be followed for generation and distribution tariffs. The interstate generation and transmission tariffs are developed by the Central Electricity Regulatory Commission and the state-specific tariffs are notified by the State Electricity Regulatory Commissions as well as the Joint Electricity Regulatory Commission. India has directed very aggressive renewable portfolio obligations; revised vide a notification dates 22 July 2022[22]. The notification has recommended an RPO of 43.33% in 2029-30 that includes wind, hydropower and other sources (solar). The notification also requires a 4% storage obligation within the solar and wind energy use. Given the increasing energy consumption in India, the RE obligations translate to a substantial absolute number for RE use in the economy.

Aggressive RE targets in India result in challenges related to the system integrity given the infirm nature of the RE. In general, the policy-making and the distribution sector is transiting towards a generation following load to a load following generation structure of the past to increase the overall capacity utilization factor. As such, the role of DSM is not moving towards demand-flexibility initiatives. At this stage, Indian utilities are in the process of planning 1 GW of flexible demand-side resource acquisition initiatives with a projected 10 GW of demand flexibility assets developed during the coming decade.

Several strategies are being promoted in the Indian power sector that require RE to be developed with round-the-clock (RTC) bidding process and also in-front-of-the-meter and behind-the-meter storage assets to be developed during the perceivable future. The RTC power developers optimize energy mix using RE (e.g., wind, solar and hydro), non-RE (e.g., thermal power plants with capacity for achieving high ramp rate), and/or ESS capacities to provide firm power to utilities and consumers.

5.1.3 United States

In the United States, compliance with statewide legislative mandates, regulatory savings or spending targets is poised to be the primary driver for the increase in utility DSM program spending through 2025. The policies that drive utility DSM investment in the U.S. include: EE resource standards; renewable portfolio standards under which EE is a qualifying resource; statutory requirements that utilities obtain “all cost-effective EE” resources; and long-term integrated resource planning requirements. However, DSM in the U.S. has evolved beyond a mere EE initiative to a broader resource adequacy opportunity. Load management strategies and load-shape objectives are identified as the important features of DSM implementation by individual investor-owned-utilities (IOUs) and electric cooperatives.

The U.S. electricity markets can be traditionally regulated or competitive markets. Some parts of the U.S. wholesale electricity market are traditionally regulated, meaning that vertically integrated

[21] https://powermin.gov.in/sites/default/files/uploads/Electricity_Act_2007.pdf

[22] https://powermin.gov.in/sites/default/files/Renewable_Purchase_Obligation_and_Energy_Storage_Obligation_Trajectory_till_2029_30.pdf

utilities are responsible for the entire flow of electricity to consumers. They own the generation, transmission and distribution systems used to serve electricity consumers. The restructured competitive markets are run by independent system operators (ISOs) and the competitive market mechanisms are used to allow independent power producers and non-utility generators to trade power. In restructured competitive markets, "utilities" are commonly responsible for retail electricity service to customers and are less likely to own generation and transmission resources[23].

The regulated electricity markets in the U.S. have placed specific emphasis on harnessing multiple decarbonization and cost-optimization strategies, evaluated as a least-cost integrated resources planning approach. Although state legislations are important, the federal electricity regulator has also intervened in the recent past.

A report on "Benefits of Demand Response in Electricity Markets and Recommendations for Achieving Them" published by the U.S. Department of Energy in February 2006 estimates that in 2004 potential DR capability equaled about 20,500 megawatts (MW), 3% of total U.S. peak demand, while actual delivered peak demand reduction was about 9,000 MW (1.3% of peak), leaving ample margin for improvement. To encourage the use and implementation of DR in the United States, the Federal Energy Regulatory Commission (FERC) issued Order No. 719, opening wholesale markets to DR, allowing large industrial customers to be compensated at wholesale rates for dialing back power demand in response to price signals when grid conditions are stressed. In March 2011, FERC Order No. 745 requires a certain level of compensation for providers of economic DR that participate in wholesale power markets.

In 2018, FERC promulgated Order 841, opening the wholesale markets to the full participation of electric storage resources (ESR). In 2020, FERC issued Order No. 2222[24] with updates in 2021[25], enabling distributed energy resources (DERs) to participate in the electricity markets run by the regional grid operators. The term "DERs" covers a wide variety of resources, including electric battery storage systems, rooftop solar panels, products like smart thermostats that enable one to reduce power usage, EE measures, thermal ESS such as ice storage, or electric vehicles and their charging equipment.

Several state-level and federal initiatives in the U.S. have considered multiple streams of benefits from EE and DER. The structure of financial evaluations of EE and utilities-moderated DSM follows a prudence check that establishes if the incentives/subsidies and the program costs incurred by the IOUs or electric cooperatives are within a rational limit of rate impact, The prudence checks are necessary to establish the fact that the rate-payer investments, socialized throughout the networks is beneficial to all the consumers. A wider base of system benefits includes:

1. Utility system benefits, comprising power supply options, transmission and distribution (T&D) capacity, environmental, losses & reserves, risk and credit & collection;
2. Participant benefits (other fuels, water, sewer, O&M costs, health impacts, employee productivity, comfort); and

[23] https://www.epa.gov/green-power-markets/us-electricity-grid-markets

[24] https://www.ferc.gov/sites/default/files/2020-09/E-1_0.pdf

[25] https://www.ferc.gov/ferc-order-no-2222-explainer-facilitating-participation-electricity-markets-distributed-energy#:~:text=The%20Federal%20Energy%20Regulatory%20Commission,run%20by%20regional%20grid%20operators.

3. Societal benefits (air quality, water, solid waste, energy security, economic development, health impacts). The tariff pass-through of the investments in the EE and the load balancing programs are structured through clearly defined benefits-costs and tariff impacts. The regulatory process also emphasizes on the measurement and verification of EE and DSM programs that have been launched under an approval from the regulators.

5.2 Recommended Regulatory Mechanism for DSM in the Philippines

Until 2019, EE activities had generally been voluntary, with few incentives to support widespread adoption. In early 2019, the long-awaited EEC Act was enacted, putting in place the country's first law specifically relating to EE. The shift from voluntary to mandated activity, through the introduction of fines as well as incentives, is likely to have significant impact on EE actions. This change also gives utilities and consumers a clear indication of the government's commitment to scaling up EE across all sectors.

While the passing of the EEC Act is a major step forward for the Philippine Government and DOE, there is still much work to be done to implement its provisions. It is critical that comprehensive, clear, and appropriate strategies and plans are developed to accelerate implementation and build investor confidence in the EE market.

The development of DSM programs is a requirement under the EEC Act. The Act states that DSM programs for the electric power industry would be pursued through load management and other measures implemented by DUs to encourage end-users to manage their loads in an efficient manner. DSM can enhance system stability and reliability by paying users to voluntarily lower their demand during peak periods of high demand. The Department Circular DC 95-08-007 (Instituting Demand Side Management by Electric Utilities) issued on 2 August 1995 directs all Electric Utilities (EU) to develop and submit DSM plans to the Energy Regulatory Board (ERB) every 2 years beginning in 1996. The circular also stipulates that the ERB shall develop and implement a regulatory framework to enjoin EUs to invest in DSM projects through the provision of economic incentives via other rate making methodologies; and such DSM programs to be monitored and evaluated by ERB from time to time. There is evidence of initial DSM plans being developed and submitted by DUs. However, there is no evidence of any follow up implementation coordinated by ERB or ERC. Hence, a policy would first need to be developed and a strategy adopted by scoping out best practices in DSM and conducting extensive stakeholder engagements. The strategy would also identify industries and sectors which DSM programs should target to be most effective (e.g., industrial, commercial, residential).

The development of a sound policy and regulatory framework would guide the implementation of DSM programs, which would include EE and RE, and other measures to support NGCP, as the transmission network provider and system operator, in considering DSM in generation and T&D expansion planning and operations. Through managing the demand patterns, DSM will help optimize the use of existing infrastructure, reduce the need for costly expansions, and enhance overall grid reliability and efficiency. It also contributes to meeting the significant peak demand forecast to 2040 and beyond.

6 FRAMEWORK FOR DEMAND SIDE MANAGEMENT POLICY AND PROGRAMS

6.1 Vision

The Vision of the DSM Policy is to support creation of a resilient, reliable, efficient, clean and affordable electricity system leading to economic, social and technological goals by meeting load profile objectives with strategic conservation, load management and demand response options.

6.2 Mission

The Mission of the DSM policy is to support the Government's objective of building an energy-efficient nation and facilitating increased use of RE and supported through, but not limited to, the following interventions:

- Reduced energy consumption through enhanced efficiency in the domestic, commercial, industrial, public and municipal sectors.
- Strategic load management through permanent load shifting (PLS) using TOU tariffs.
- Active load management in the form of DR to balance the supply-demand gaps and to integrate higher levels of RE. Box 1 provides a definition of strategic and active load management.

Box 1: Working Definitions of Strategic and Active Load Management

Strategic load management or a permanent load shift (PLS) is a tariff trigger that allows the users and the DU, or the retail electricity supplier (RES) in the case of contestable customers, to permanently shift the loads to benefit from the Time-Of-Day (TOD)/TOU tariffs. It offers an incentive to use energy during the low-tariff hours and disincentive to contribute to the peak during high tariff periods. The key is to design the tariff that is reflective of the system peaks.

Active load management (or a demand response – a term that plan to use interchangeably) is the unexpected distress in the system - like voltage/frequency imbalances. Hence, it is not a routine process, where timings are not predicted upfront and are a function of what the DU wants. It is purely a demand response. We are adding value in the Philippine context by benchmarking it with the high solar/wind hours (in both cases PLS and active load management).

6.3 Strategic Objectives

The DSM policy shall work towards creating the enabling environments and least cost infrastructures in support of the following stated objectives:

- Create energy conservation and load management strategies using Integrated Resources Plans (IRP) for all load serving entities;
- Identify DSM efforts that support higher capacities of renewables integrated within the Philippine electricity system;
- Create models of cost-effective DSM program designs, creation of institutions, support deployment through practical cost recovery mechanisms;
- Leverage smart metering and online monitoring/metering infrastructure that is supported through the DOE budgets as well as the DUs;
- Positively influence the tariff designs that create win-win situations for utilities, system operators, and consumers, specifically towards facilitating permanent load shifts;
- Create national human resources capacity for deploying DSM activities; also, promoting research & development efforts.

6.4 Policy Goals and Targets

Through this policy mandate, relevant regulatory frameworks shall be developed by DOE to enable recognition of IRP and DSM in the Power Development Plan (PDP). An IRP shall be developed, every three years, by DOE to identify least-cost demand-side and system-wide resources.

The initial goals, during the first five years, to the Mission Statement include:

- **Strategic Conservation** – influence through mass-market initiatives and public procurement, stimulating ***significant penetration of energy efficient models of related appliances*** (lighting, air-conditioners, refrigerators, motors, etc.) in the Philippine market.
- **Permanent Load Shifting** – identify RE-generation-reflective time slots that show lowest wholesale market prices and implement a large-scale load management initiative with the DUs that result in ***peak demand reduction*** nationwide.[26]
- **Active Load Management** – undertaken through DR initiatives via DUs and create a large-scale pilot and mainstream programs amounting to ***national peak demand reduction,*** and

[26] Specific programs to be pursued in the **Permanent Load Shifting (PLS)** opportunities include the following steps: 1) identify the solar or other renewable energy generation opportunities and develop a deeper understanding of the loads and the end-use sectors that definitively contribute to the load curves; 2) pilot a new tariff design to test out changes in the end-use consumption that can be reduced in the high-tariff timeslots and that can be increased during the low-tariff time-slots. The tariff designs in the form of TOD/TOU are designed on a seasonal basis.

to identify load-reflective end-use ramping-up and ramping-down of end-uses in the government, industrial and commercial sectors[27].

It should be noted that the abovementioned initial goals for strategic conservation, permanent load shifting, and active load management are based on the initial review and assessment of the data provided in the Power Supply and Procurement Plan (PSPP) reports. The initial goals are for consideration by DOE, which should be guided by the Philippine development goals and the implementation principles of DSM.

6.5 Key Design and Implementation Principles

The DSM Policy recommends the following implementation principles that are designed to develop a detailed approach towards rolling-out DSM programs:

- **Data driven targets-setting through Load Research:** The targets for strategic conservation, permanent load shifting and active load management through demand response shall be set-up by conducting a **sample-based load research initiative** for all the sectors of interest in each DU. Given the structure of the power sector in the Philippines, DOE shall coordinate the load research activity including sourcing of funds.
- **Smart meters as an enabler:** Deployment of smart meters shall be carried out in all major utilities for key customer categories and data captured through the smart meters shall be used for developing strategies to deploy permanent load shifts and active load management using DR.
- **Mass-market EE appliances deployment through financing intermediation:** A national level large energy services company, alongside a public financing institution shall be used to deploy EE appliances in multiple sectors of interest.
- **Alignment of DR in the power markets:** Relevant manuals, rules, and guidelines pertaining to utilization of DR as resource options for balancing supply and demand shall be developed, reviewed, and amended by the wholesale power markets operated by IEMOP and governed by PEMC.
- **PLS and Active Load Management/ DR to be integrated in the renewable energy integration options:** Permanent load shifting and active load management using DR shall be used as flexible resources to integrate more renewables to align with the RE aspirations of the country.
- **Practical cost recovery mechanisms for utility-specific DSM activities:** Given the structure of the power sector, DOE shall manage DSM policy and programs, however practical cost recovery mechanisms shall be established for reimbursing the costs thereof to DUs.

[27] Specific programs to be pursued in **Active Load Management (ALM) / Demand Response (DR)** include the following steps: 1) identify non-essential and essential loads in key end-uses in the government, industrial and commercial consumer segments that can be selectively ramped-up or ramped-down based on the requirements of system integrity and requirements.

6.6 Stakeholders in Demand Side Management Implementation

The guiding principles of the DSM implementation and the institutional arrangement shall be aligned with the EEC Act of 2019, which states that DOE with the assistance of ERC and the PEZA, shall pursue a DSM program for the electric power industry for the reduction of energy consumption through effective load management resulting to the decrease of power demand and the migration of power demand from peak to off-peak periods or such measures undertaken by DUs to encourage end users to properly manage their loads to achieve efficiency in the utilization of fixed infrastructure in the systems with the use of EE and/or RE technologies and systems. In view of this, DOE shall act as the primary entity to drive implementation of the DSM policy and programs.

6.6.1 Institutional Arrangement for Demand Side Management Implementation

In addition to the existing DSM programs governed by ERC's resolutions (i.e., TOU and ILP), it is anticipated that a diverse range of new DSM programs, varying in scales, will be concurrently developed and implemented by DUs across the country. Given that these DSM programs will be executed with or without close supervision by DOE, ERC, NEA and other entities, it is crucial for DOE to set up pertinent working committees that can facilitate seamless communication and information exchange among DUs and other stakeholders. The working committees can play a vital role in ensuring that DSM programs that will collectively contribute to the national level DSM goals are given priority, and also maintain the integrity of the DSM program evaluation. At a minimum, the two following committees should be established.

- **DSM Facilitation Committee:** The DSM Facilitation Committee will be established to provide overall coordination among DOE, ERC, NEA, PEMC, IEMOP and other key agencies in the Philippine power industry (including DUs) in guiding different types and sizes of DUs in development and implementation of DSM programs. The DSM Facilitation Committee will convene at least twice a year, and the committee shall be chaired by a high-level government official nominated by DOE. DOE-EUMB will act as the committee secretariat.
- **DSM Program Monitoring & Evaluation Committee:** The DSM Program Monitoring & Evaluation (M&E) Committee will be formed to facilitate implementation of M&E activities to be undertaken by DUs and to validate the M&E results. The committee members are invited representatives from DOE, ERC, NEA and DUs (nominated on a rolling basis). The Committee will ensure the compliance with the M&E framework for DSM programs and disaggregated DSM program data by gender are monitored to assess the differential impact of DSM measures and activities on women and men.

The proposed institutional arrangements for DSM implementation in the Philippines are given in **Figure 6-1**.

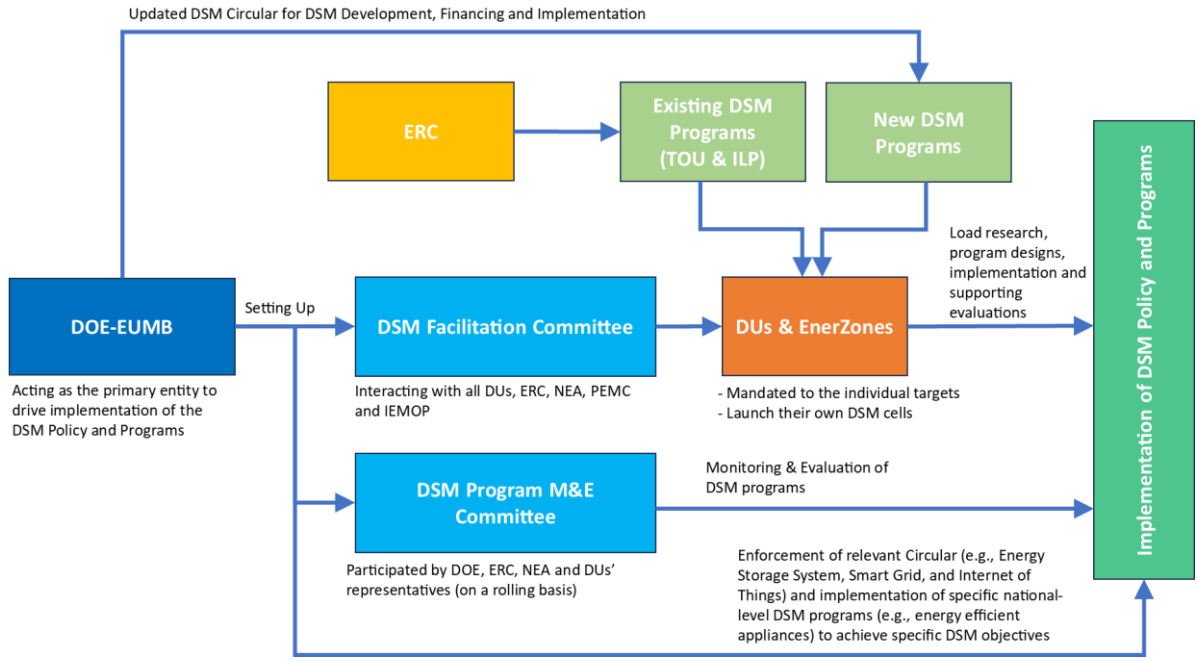


Figure 6-1: Institutional Arrangement for DSM Policy and Program Implementation

6.6.2 Roles and Responsibilities of Stakeholders

Existing roles and responsibilities of key stakeholders and their anticipated engagement and contribution during the development and implementation of DSM programs are summarized below.

Table 6-1: Roles and Responsibilities of Key Stakeholders in DSM Program Development and Implementation

Stakeholder	Existing Roles and Responsibilities in DSM	Engagement and Contribution during the Development and Implementation of DSM Programs
Department of Energy (DOE)[28]	DOE has a responsibility to act as a conduit where government involvement is necessary for grants and/or soft loans to DUs for the study and/or implementation of DSM. DOE is also responsible for development and implementation of a regulatory framework to enjoin DUs to develop and implement DSM projects as well as for	In addition to the existing roles and responsibilities, DOE is required to prepare a DSM Circular in coordination with various relevant stakeholders and government agencies, as stated in the Philippine Energy Plan (PEP) 2023-2050. The DSM Circular shall serve as an enabling mechanism to enjoin and incentivize DUs and market

[28] Existing roles and responsibilities of DOE in DSM reference both DC 95-08-007 and DC 2014-08-0014.

Stakeholder	Existing Roles and Responsibilities in DSM	Engagement and Contribution during the Development and Implementation of DSM Programs
	monitoring and compilation of DSM efforts and activities for inclusion in the overall energy plan of the country. Additionally, DOE is responsible for development and implementation of various DSM programs and projects nationwide with a system of incentives and penalties. DOE also has the responsibility to monitor the compliance of DSM implementation through the Task Force composed of the Electric Power Industry Management Bureau (EPIMB), EUMB and the Office of the Secretary (OSEC).	operators to consider DR as resource options for balancing supply and demand. It is crucial that DOE references existing roles and responsibilities of various stakeholders specified in all active DSM-related legal documents. Recommendations on the key focus areas of the new DSM Circular are provided in Appendix A.
Energy Regulatory Commission (ERC)[29]	Based on the Framework for DSM approved in 1996, DUs is required to submit DSM plans for review and approval by ERC. ERC shall also consider other rate making methodologies so that utilities are provided economic incentives for investing in DSM programs. Such DSM programs shall from time to time be appropriately monitored and evaluated by ERC.	ERC will be invited to participate in the DSM Facilitation Committee. In addition to the existing roles and responsibilities, ERC is required to update and streamline the evaluation mechanisms for approval of any rate adjustments due to implementation of DSM programs to optimize the lead time of new DSM program development and implementation.
National Electrification Administration (NEA)	NEA has no specific role and responsibility pertaining to development and implement of DSM programs.	NEA will be invited to participate in the DSM Facilitation Committee and the DSM Program Monitoring & Evaluation Committee and facilitate electric cooperatives (ECs) in accessing relevant funds, such as Reinvestment Fund for Sustainable Capital Expenditures (RFSC), and providing loan or grant facilities to support implementation of DSM programs.

[29] Existing roles and responsibilities of ERC reference the roles and responsibilities of ERB as outlined in DC 95-08-007.

Stakeholder	Existing Roles and Responsibilities in DSM	Engagement and Contribution during the Development and Implementation of DSM Programs
Distribution Utilities (DUs)	DUs are required to prepare and submit DSM plans for review and approval by ERC, execute the approved plans, and evaluate the program achievements.	In addition to existing roles and responsibilities, DUs are required to collaborate with the DSM Facilitation Committee and the DSM Program Monitoring & Evaluation Committee to ensure successful planning and implementation of DSM programs. The DSM plans shall be integrated with the Distribution Development Plan and the Power Supply Procurement Plan as appropriate.
The Philippine Electricity Market Corporation (PEMC) and Independent Electricity Market Operator of the Philippines Inc. (IEMOP)	PEMC and IEMOP have no specific role and responsibility pertaining to development and implement of DSM programs.	PEMC and IEMOP will be invited to participate in the DSM Facilitation Committee and receive updates on the development and implementation of DSM programs by DUs and EnerZones. PEMC shall conduct necessary review and update of relevant manuals, rules and guidelines that include DSM programs in WESM.
Philippine Economic Zone Authority (PEZA)	PEZA has no specific role and responsibility pertaining to development and implement of DSM programs.	PEZA will be invited to participate in the DSM Facilitation Committee and the DSM Program Monitoring & Evaluation Committee to support the development and implementation of DSM programs by EnerZones.
Retail Electricity Suppliers (RESs)	Under the ERC's ILP Guidelines, RESs and their contestable customers enter into a tripartite agreement with the DU for implementation. RESs have no other specific role and responsibility pertaining to development and implement of DSM programs.	RESs should be required to collaborate with the DSM Facilitation Committee and the DSM Program Monitoring & Evaluation Committee to ensure successful planning and implementation of DSM programs.

6.7 Financing Demand Side Management Implementation

International experience suggests that the cost recovery mechanism through a tariff pass-through is a well-established mechanism. The tariff pass-through mechanism has been adopted in multiple large economies such as India, South Africa and the U.S. In addition, other possible financing mechanisms for DSM program implementation include establishment of a special purpose fund for DSM and using the "performance-based regulations" as a means to award DUs for managing the load shape.

In the Philippines, recovering the costs of DSM is feasible, but the proposed mechanisms for DSM cost recovery must undergo review and approval by ERC. Incentives shall also be provided to encourage DUs to invest in DSM programs, for example, a concessional loan program for DUs to promote adoption of energy efficient appliances among residential consumers. In addition, the Reinvestment Fund for Sustainable Capital Expenditures (RFSC), previously known as the Members' Contribution for Capital Expenditures (MCC), has the potential to provide funding for the development and implementation of DSM programs by ECs. ERC has authorized ECs to collect RFSC contributions from their member-consumers in accordance with ERC Resolution No. 20, Series of 2009. The RFSC is intended to support the expansion, rehabilitation, or upgrading of the ECs' existing electric power systems as per their ERC-approved Capital Expenditure (CAPEX) Plan. Considering this, utilizing RFSC funds for financing DSM initiatives requires discussion with NEA and relevant stakeholders, and subsequent approval by ERC.

6.8 Gender Equality and Social Inclusivity

Development and implementation of DSM programs will incorporate gender, equality and social inclusion considerations, and the DOE Gender Toolkits for the energy sector[30] published in 2016 and the Gender Equality and Women's Empowerment (GEWE) Plan 2019-2025[31] will serve as the guidance in integrating gender and development (GAD) in DSM programs. Specifically, the GAD design checklist and toolkit will be applied to ensure contribution to gender equality and social inclusivity, and gender- and social-inclusive design features, activities and outputs can be effectively integrated into each DSM programs.

All DSM program options will analyze gender roles in program activities to identify opportunities for strengthening women's participation and leadership. Collection of gender-disaggregated data and gender-specific information for monitoring program outputs will occur during both the design and implementation phases of the DSM programs. Communication and outreach efforts in each DSM program will be tailored to ensure the messages reach both women and men. It is likely that gender-specific communication will be more prominent in the residential DSM programs, where decision-making is more likely to be shared between genders. For instance, a DSM program with a strategic conservation objective could employ an educational program targeting women to raise awareness and alter household behavior patterns, thereby enhancing energy conservation within

[30] https://www.doe.gov.ph/sites/default/files/pdf/doe_gad/doe_gad_toolkit.pdf

[31] https://library.pcw.gov.ph/updated-gender-equality-and-womens-empowerment-plan-2019-2025/

households. In any DSM programs that involve the adoption and application of DSM technologies, the promotion of equal access to these technologies and associated opportunities will be prioritized. Specific details regarding gender equality and social inclusivity will be outlined in the implementation and monitoring and evaluation plan for each DSM program.

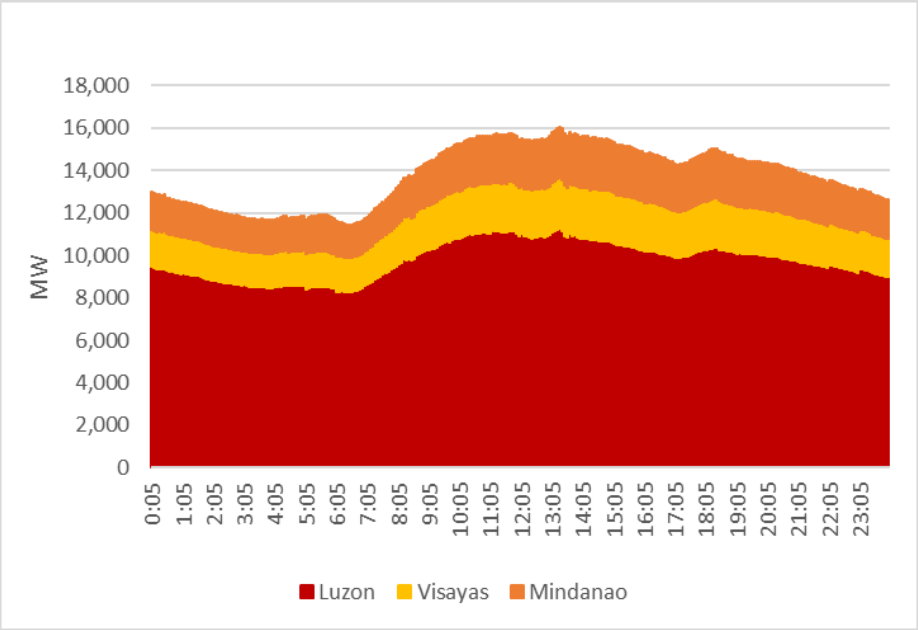
6.9 Monitoring and Evaluation

Each DSM program design shall include a detailed monitoring & evaluation (M&E) plan and the associated costs for this activity will be included in the overall program costs. In principle, all DSM programs will be monitored throughout and evaluated upon completion. The DSM programs should also be subjected to an annual evaluation. To support this activity, M&E Guidelines document shall be developed detailing a step-by-step approach for the types of DSM programs being implemented. The M&E Guidelines may include data analytics and cost-benefit analysis in the assessment of the effectiveness of the DSM programs. A centralized platform or database on DSM programs could be established to streamline the tracking and reporting of DSM program performance. The centralized platform/database should be equipped with a user-friendly interface for better appreciation and understanding of the consumers (particularly, the possible savings that may be attained) to encourage wider and more active participation from DUs and end-users.

7 PROPOSED DEMAND SIDE MANAGEMENT PROGRAM

7.1 Overview of Electricity Demand

Based on the system load profile data provided in the IEMOP website (www.iemop.ph), the system load profiles in the Philippines demonstrates three salient peak periods, i.e., morning peak at 11.00am, afternoon peak at 2.00pm and evening peak at 7.00pm. The load profiles of Luzon, Visayas and Mindanao grid show similar patterns compared with the overall system load profile, and the Luzon grid is the main contributor, accounting for about 70% of the overall system peak demand. While the Visayas and Mindanao grids equally contribute to the overall system peak demand with 15% share each.



Source: https://www.iemop.ph/the-market/daily-operations-reports/pds/, accessed on October 5th, 2023

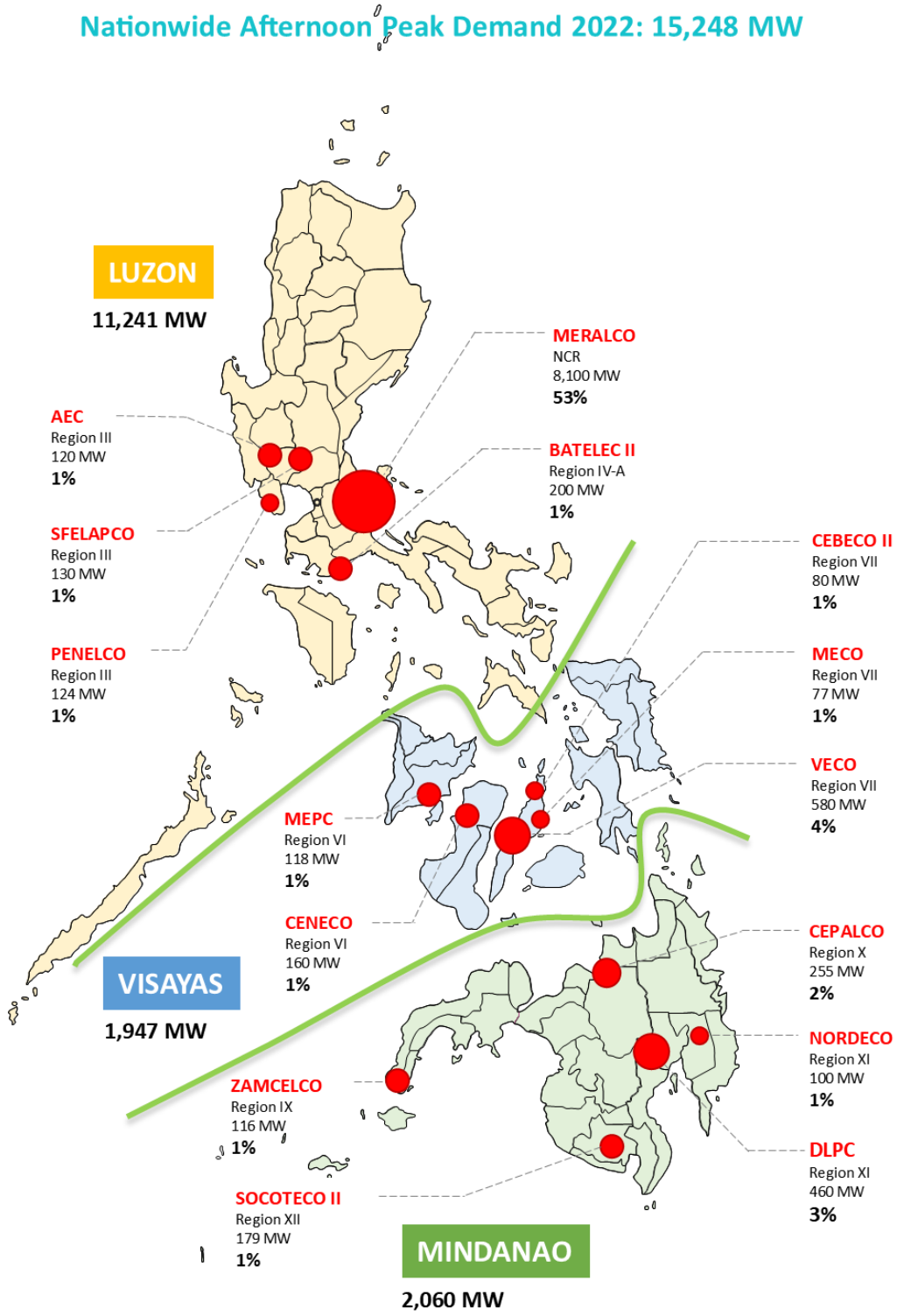
Figure 7-1: System Load Profile in the Philippines, 5th October 2023

There is no available information on the peak demand contribution by different end-use sectors in the Philippines. However, based on international experience, it can be suggested that the morning and early-afternoon peaks are caused primarily by cooling load in industrial and non-residential buildings. While the evening peak is primarily constituted by lighting, cooling and other loads in residential buildings.

7.2 Characteristics of DUs' Load and Peak Demand Profiles

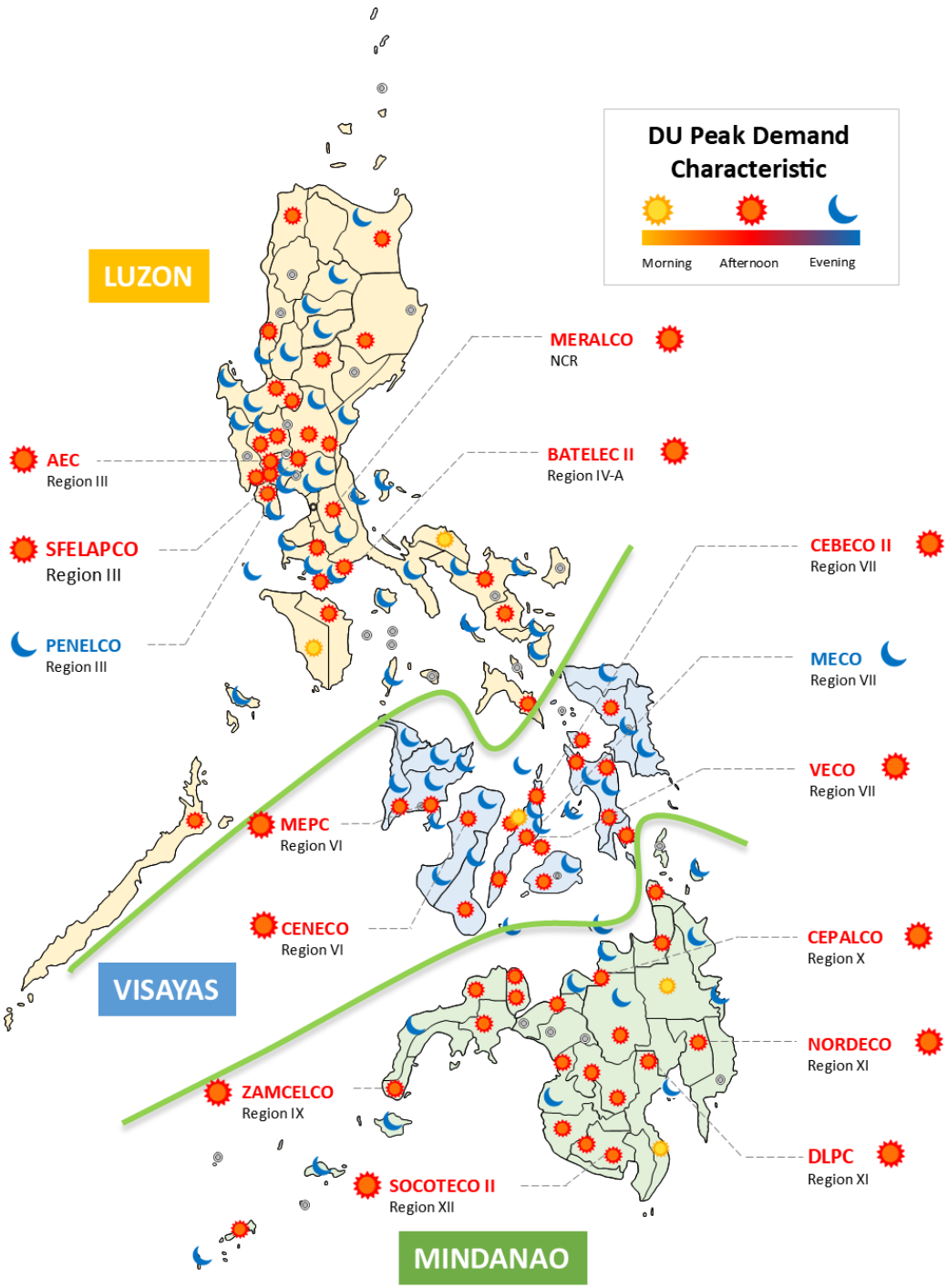
Analysis of utility data provided in the Procurement Supply Procurement Plan (PSPP) reports submitted to DOE by DUs reveals that top five DUs in Luzon, Visayas and Mindanao cumulatively contribute around 74% of the afternoon nationwide peak demand in 2022, as illustrated in **Figure**

7-2 and **Figure 7-3** shows typical daily load profiles of DUs in the Philippines. It is found that most large DUs have afternoon peaks, while smaller DUs tend to have the evening peak demand profiles.



Source: Author's analysis based on 2023 PSPP reports

Figure 7-2: Contributions of Large DUs to Afternoon Peak Demand in the Philippines



Source: Author's analysis based on 2023 PSPP reports

Figure 7-3: Typical Peak Demand Profiles of DUs in the Philippines

The PSPP reports also provide some information on generation dispatching during the afternoon peak period in each region and it is found that peaking power generation across the three regional grid is dominated by fossil fuel power plants, except for the Luzon grid where renewable energy power plants (solar and geothermal) with a total generation capacity of 115 MW are designated as the peaking plants. Based on the PSPP report, solar and geothermal power plants contribute around 19% of the total peak generation capacity.

Table 7-1: Type and Capacity of Peaking Plans in Luzon, Visayas and Mindanao

Type of Peaking Plant	Luzon	Visayas	Mindanao	Total (MW)
Coal	145	191	50	**386**
Diesel	0	19	93	**111**
Solar	110	0	0	**110**
Geothermal	5	0	0	**5**
Not Specified	0	0	15	**15**
Total (MW)	**260**	**210**	**157**	**627**

Source: Author's analysis based on 2023 PSPP reports

7.3 Demand Side Management Objectives and Program Options

7.3.1 DSM Objectives

Determination of the DSM objectives are usually carried out based on the load profile characteristics of DUs. The load profile data could be the results of the load research activities conducted by the utility or the consumption data gathered through smart metering systems. Various load shape objectives, as shown in **Figure 7-4**, can be adopted to serve the specific needs of each DUs.

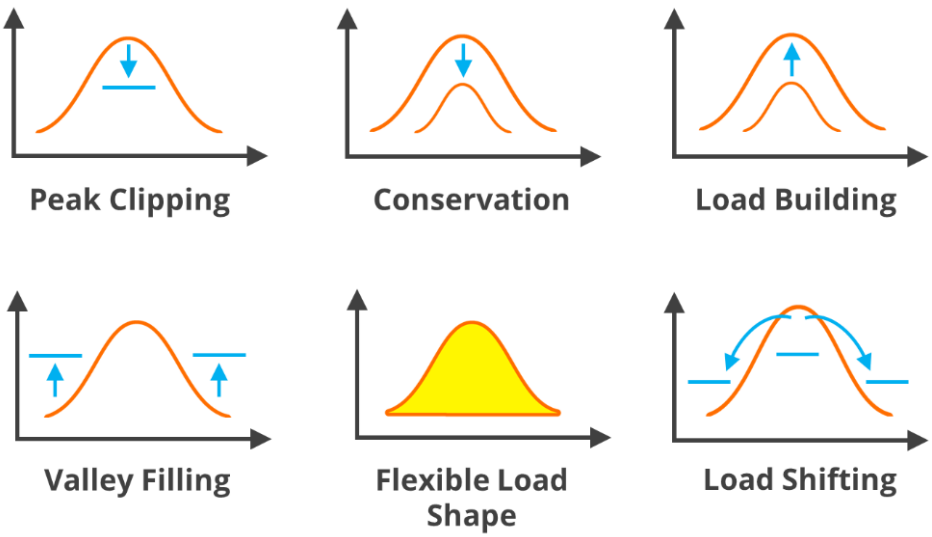


Figure 7-4: DSM Load Shape Objectives

The DSM policy and program framework aims to focus on the following interventions over the next three years. These interventions encompass multiple DSM objectives, including conservation; peak clipping, flexible load shapes and load shifting.

1) **Strategic conservation** – This intervention aims to reduce energy consumption through enhanced efficiency in the domestic, commercial, industrial and government sectors. This can be achieved through mass-market initiatives and public procurement, stimulating penetration of at least 50% market share of energy efficient models of related appliances (air-conditioners, refrigerators, motors, etc.).
2) **Strategic load management** – This intervention aims to create permanent load shifts (PLS) through Time-Of-Use (TOU) tariffs.
3) **Active load management** – This intervention will be in the form of demand-response to balance the supply-demand gaps and to integrate higher levels of renewable energy. A large-scale load management initiative could also be run with DUs to result the peak demand reduction.

7.3.2 Proposed Demand Side Management Programs

Based on the framework and goals of the DSM policy, the initial DSM program options for the Philippines with different DSM objectives are prepared as summarized in **Table 7-2**. These initial DSM programs are presented as generic representations of the DSM strategies to address different peak periods and overall energy savings. These initial DSM program options allow for a more detailed analysis to be conducted by different types and sizes of DUs, with guidance and support from DOE. The detailed analysis will facilitate a systematic program implementation rollout by individual and a cluster of DUs.

Table 7-2: Proposed DSM Program Options

No.	Title & Description	Targeted Peak Demand	DSM Objective
1	**Water Pumping Load Management Program** – Staggering of pumping loads based on the generation profiles of solar plants	Late morning and afternoon peak	Load Shifting and Conservation
2	**Commercial Cooling Load Management Program** – Matching peak solar generation and air-conditioning load in the commercial sector, and working with commercial consumers to pilot the program	Late morning and afternoon peak	Load Shifting and Conservation
3	**Energy Efficient Public and Street Lighting Program** – Identifying appropriate lighting and control technologies that cost effectively reducing peak demand reduction and energy consumption	Evening peak	Conservation
4	**Energy Efficient Appliance Program** – Promoting energy efficient appliances	All through the day	Conservation

No.	Title & Description	Targeted Peak Demand	DSM Objective
	certified by PELP through incentives and financial mechanisms		
5	**Efficient Motors and Motors-Driven systems program** – Promoting replacement of inefficient motors and motor-driven systems in the textiles, food processing and machining industry	All through the day	Conservation
6	**Efficient Cold-chains Chillers Program** – Promoting efficient use of chillers in the supermarkets and food warehouses	All through the day	Conservation
7	**Consumer EE&C Awareness Program** – Enhancing EE&C awareness of consumers and promoting EE&C behavior.	All through the day	Conservation
8	**DSM Load and Market Research Program** – Determining the shape of a utility's system profile and consumers' behaviors to form the basis for setting DSM objectives	All through the day	To be determined by the results of the load and market research

It should be noted that the last DSM program option (No. 8) is crucial for DUs where operations/performance of "end-uses" and behaviors of "end-users" are not yet well understood. The abovementioned DSM program options shall also be carried out in conjunction with the ongoing DOE's efforts on the Philippine Energy Labeling Program (PELP) for household appliances and public awareness programs on EE&C.

Following the acceptance of the proposed DSM programs, the implementation and M&E plans will be developed to provide guidance to DUs. The implementation plan will encompass all key elements crucial for ensuring the effective and successful execution of the DSM program. This includes, but not necessarily limited to, organizing DSM programs, managing the implementation process, marketing and communications, allocation of human and financial resources, regulatory compliance, technical design/engineering, procurement/construction/installation (if applicable), M&E, and reporting.

The M&E plan will include measurement and verification (M&V) of the DSM program's impacts on energy efficiency and reductions in greenhouse gas (GHG) emissions. Additionally, it will involve process/market evaluations aimed at tracking cost-effectiveness and public perceptions of the program. The M&E plan, with SMART (Specific, Measurable, Achievable, Relevant, and Time-bound) indicators, will assist DUs in measuring, capturing, and evaluating results aligned with the objectives of the DSM program. These objectives may include energy savings, peak demand reductions, and other associated outputs, such as gender-specific outcomes, consumer awareness, and market acceptance.

7.3.2.1 Program 1: Water Utility Pumping Load Management Program

The program focuses on the use of electric induction motors, which are the main prime movers for all pumping stations. Motors account for a significant component of the operating costs in pumping stations and water utilities. These motors also contribute to the base load and peak demand in DUs. The program aims at promoting the benefits of appropriate operational controls which will match pumping loads with the generation of solar power plants. Additionally, the program shall also integrate energy efficient technologies such as energy-efficient motors and variable speed drives to ensure effective use of renewable energy.

Table 7-3: Program 1 - Water Utility Pumping Load Management Program

Program	**Water Utility Pumping Load Management Program**
Sector	All end-use sectors
Strategic Objective	Load shifting to predominant solar generation hours and energy conservation.
Rationale	Water utility pumping loads are not necessarily aligned to the load shape objectives of the utilities. With the solar generation costs going down substantially, water pumping carried out during high solar generation hours will create a win-win situation for both water and power utilities.
Strategy	Staggering of pumping loads based on the generation profiles of solar plants through study of solarization of the smaller utilities and the municipalities; creation of load profiles for municipal water pumping operations and shifting the pumping hours to high solar generation hours while confirming other loads are not impacted in any manner.
Target Market Segment	Bulk water pumping systems and pumping stations across all end-use sectors.
Tasks / Activities	a) Study load profiles of top 10 pumping station sites in key regions of interest where higher levels of solar plants are set-up b) Identify prospecting sites by reaching out to more than one pumping station assets under the purview of the utilities and cooperatives c) Pilot load staggering of the pumping loads for a few pumping station sites to ensure there is no direct impact on the grid power available d) Install a centralized network operating center to map all the pumping station sites where the loads can be tracked alongside solar generation plants' performance

Program	Water Utility Pumping Load Management Program
	e) Carry out metering system installation and data communication as peer the prevalent data protection laws f) Install online monitoring and relay systems on key pumping stations where metering is done and the DOE envisages quicker installation services g) Create a simple automation process to communicate starting on and off of the pumping networks based on the forecast of solar power generation h) Develop a protocol to assess the load shapes and comparison of pre-project and post-implementation of metering and relay systems i) Quantify benefits of the proposed systems installed and commission active load management options
Expected Outputs	a) Demonstration of convergence of municipal water pumping and solar generation hours b) Retention of service quality by the water utilities c) Savings in power procurement costs incurred by the discoms during the daytime
Implementing Agency	DUs in key regions of interest with overall project piloting and implementation responsibility assumed by the selected implementation contractors.
Other Stakeholders	Water utilities, local urban bodies, implementation private sector organizations involved in DSM programs.
Monitoring Procedures	Baseline creation with actual running of the pumping assets and post-implementation load shifting data driven M&E approach.
Budget Estimate	US$100,000 set-up as a budget for design, installation and commissioning of load management devises spread across 10 first candidate locations.
Implementation Timeframe	12-18 months

7.3.2.2 Program 2: Commercial Cooling Load Management Program

The program aims at addressing cooling loads in the commercial sector which contribute to the system afternoon peak demand. The program will conduct a study on load profiles of top 100 commercial establishments and appropriate load management systems will be installed to control

cooling load without sacrificing thermal comfort. The pilot phase will be implemented with cost and benefit analysis prior to rolling out into a large-scale implementation.

Table 7-4: Program 2 - Commercial Cooling Load Management Program

Program	**Commercial Cooling Load Management Program**
Sector	Commercial Sector
Strategic Objective	Load shifting to predominant solar generation hours and energy conservation through load management and energy efficient packaged and large air-conditioning systems.
Rationale	The air-conditioning load contributes to system peak during the afternoon hours resulting in ramping up of additional generators that are mostly fossil-fuel based. Selective staggering of air-conditioning end-uses can offer relief to the additional capacity that would be needed to cater to the ever-increasing air-conditioning loads. As such, an intervention that demonstrates benefits of reduced air-conditioning loads without compromising of thermal comfort will provide substantial system benefits.
Strategy	Promote selective remote temperature setting modulations for medium-sized (packaged units) and large centralized air-conditioning systems through the study of convergence of peak solar generation and air-conditioning use in commercial sector – establishments such as small shops, offices, large offices and malls. Based on the analysis, enroll up to 100 consumers in the first pilot and work with them to reduce overall loads through small incentives.
Target Market Segment	Commercial sector – small shops, small commercial establishments, large commercial offices and malls targeting higher levels of low-voltage and all medium-voltage consumers in the commercial sector.
Tasks / Activities	a) Study load profiles of top 100 commercial establishments (small and large combined) correlating temperature settings, occupancy levels and energy management practices b) Identify prospecting sites in one or multiple DUs c) Run mini pilots on temperature increase and decrease (pre-cooling) at key sites d) Install remote temperature sensing and relay systems on the air-conditioning systems with the consent of the end-users e) Develop a standardized protocol to assess pre-trigger (baseline) and triggered reduced energy consumption in selected time periods for program evaluation

Program	Commercial Cooling Load Management Program
	f) Run 10 pilots through the year to signal modulating the temperature settings during high and low solar hours beyond a certain load/demand threshold g) Assess the costs and the benefits of such an initiative and willingness to participate with price elasticity (levels of incentives) h) Work with the wholesale markets and the utilities to identify power procurement costs, peak power purchases and tariff arbitrage that is created to be shared between the utilities and participating consumers
Expected Outputs	a) Demonstration of remote monitoring and relay-based modulations of key end-use-level air-conditioning system b) Clear tariff arbitrage identified as triggers to have the air-conditioning loads reduced
Implementing Agency	Utilities in key regions of interest with overall project piloting and implementation responsibility assumed by the selected implementation contractors and wholesale power markets operator as a partner
Other Stakeholders	Utilities, end-users, (relays and remote temperature sensing) equipment suppliers and occupants of built environment.
Monitoring Procedures	Baseline creation with actual running of the air-conditioning systems and comparison with post-event energy use.
Budget Estimate	US$100,000 set-up as a budget for design, installation and commissioning of load management devises spread across 100 first candidate locations.
Implementation Timeframe	12-18 months

7.3.2.3 Program 3: Energy Efficient Public and Street Lighting Program

The program aims to improve efficiency and quality of public and street lighting and reduce impacts of these public services to the system evening peak. Although LED lighting technologies for public and street lighting have become more affordable over the past decade, additional savings can be achieved through integration of control systems and adoption solar lighting technologies.

Table 7-5: Program 3 - Energy Efficient Public and Street Lighting Program

Program	Energy Efficient Public and Street Lighting Program
Sector	Public and municipal sector
Strategic Objective	Energy conservation through public and street lighting control systems and solar lighting technologies
Rationale	The public and street lighting systems are essential services provided by governments to ensure safety and security at night for drivers and pedestrians alike. Demands for these services are increasing in both rural and urban areas. These public and street lighting systems are usually controlled by light sensors, and they directly contribute to the evening peak. The urgency to replace old road lighting with more energy-efficient technologies can no longer be ignored, given limited local and national government units' budgets, and rapid growth in overall electricity demand. LED lighting technologies, coupled with the use of renewable energy sources and intelligent controls can reduce both evening peak demand and energy consumption.
Strategy	Retrofit conventional street lighting technologies with LED and solar lighting technologies and integrate proper management and control systems for public and street lighting. This will be carried out through the analysis of inventory of existing lighting technologies and typical control systems adopted by local government units and identify appropriate lighting and control technologies that cost effectively reducing peak demand reduction and energy consumption. Based on the analysis, select local government units for pilot implementation and prepare a plan for national roll-out.
Target Market Segment	Local government units operating public and street lighting systems.
Tasks / Activities	a) Identify potential local government unit and DU partners with evening peak demand b) Compile and analyze inventory of existing lighting technologies and control systems of public and street lighting c) Identify appropriate lighting and control technologies that cost effectively reducing peak demand reduction and energy consumption d) Install energy efficient lighting technologies with renewable energy sources and control systems e) Analyze cost and benefits for local government units, DUs and the country, and develop a plan and implementation model for nationwide roll-out

Program	Energy Efficient Public and Street Lighting Program
Expected Outputs	a) Appropriate lighting and control technologies that cost effectively reducing peak demand reduction and energy consumption b) Implementation model for nationwide roll-out with specific DSM target
Implementing Agency	Local government units
Other Stakeholders	DUs with salient evening peak demand and DOE.
Monitoring Procedures	Baseline creation with estimation or measurement of actual energy consumption, and comparison with post-event energy use.
Budget Estimate	To be determined after the inventory analysis
Implementation Timeframe	12 months

7.3.2.4 Program 4: Energy Efficient Appliance Program

The program aims to encourage residential customers to purchase more energy efficient appliances through incentives and financial mechanisms that help overcome the major barrier on the high up-front cost of energy efficient appliances. Multiple incentives and mechanisms can be developed and implemented in collaboration with DUs, for example, a financing facility allowing residential consumers to pay in installments on their electricity bills or outright purchase at discounted prices. In addition, the program advertising will help overcome any lack of customer awareness, complimented by DOE's certification under the Philippine Energy Labeling Program (PELP) will help overcome customer mistrust of the manufacturers' claims about energy savings and quality of appliances.

Table 7-6: Program 4 - Energy Efficient Appliance Program

Program	Energy Efficient Appliance Program
Sector	Commercial and residential sector
Strategic Objective	Strategic conservation through adoption of energy efficient appliances certified by the Philippine Energy Labeling Program (PELP)
Rationale	The Philippines has implemented the Philippine Energy Labeling Program (PELP) for household appliances. However, there is no incentives and financial mechanisms in place to promote adoption of

Program	Energy Efficient Appliance Program
	more energy efficient models among households and small businesses.
Strategy	The strategy is to establish incentives and mechanisms to promote quality and energy efficient household appliances. The promotional strategy will focus on the pull marketing strategies with consumer educational programs together with incentives and financial mechanisms that help addressing high upfront costs of more energy efficient appliances.
Target Market Segment	Households and small businesses
Tasks / Activities	a) Identify proper incentives and financial mechanisms (such as rebate and on-bill financing) to promote energy efficient appliances with DUs b) Identify prospective DU and financial institution partners for development and implementation of the incentive and financial mechanisms c) Design the incentive and financial mechanisms for implementation with partners d) Ensure availability of qualified household appliances in the areas served by the DU partners e) Monitor and evaluate impacts of the programs through market surveys and statistical data
Expected Outputs	a) Demonstration of incentive and financial mechanisms to promote energy efficient appliances b) Increased market share of energy efficient appliances
Implementing Agency	DUs in collaboration with DOE
Other Stakeholders	Financial institutions, appliance suppliers, end-users.
Monitoring Procedures	Market survey and appliance sales data for verification of energy efficient appliance market share. Energy consumption baseline creation with estimation of annual energy consumption of existing appliances and comparison with annual energy consumption of more energy efficient appliances.
Budget Estimate	US$200,000 set-up as a budget for design and implementation of incentive and financial mechanisms

Program	Energy Efficient Appliance Program
Implementation Timeframe	24 months

7.3.2.5 Program 5: Efficient Motors and Motors-Driven Systems Program

This program aims to identify key motors and motor-driven systems (pumps, compressors, other motive loads), assess their vintages, efficiency levels and opportunities to improve their efficiency levels through a replacement initiative. The industrial sector is a backbone of the economic activity and the in-country consumption and export of produce from Philippines to other markets needs to be competitive in order to sustain the order flow. The initiative will identify the first costs, reduce the first costs through a competitive bidding and work with the industry associations and their members to demonstrate and facilitate large-scale adoption of efficient motors as a replacement initiative. Key feature of the program shall include a financing facility to be created by the DOE and partnering banks to offer low cost finance and innovative mechanisms such as the suppliers' credits to be extended to the implementing micro-small-medium and large industrial segments.

Table 7-7: Program 5 - Efficient Motors and Motors-Driven Systems Program

Program	Efficient Motors and Motors-Driven Systems Program
Sector	Light industries and large industries
Strategic Objective	Strategic conservation through adoption of energy efficient motors of the highest and latest standards of the IE-4 level (super premium) and IE-3 (premium) efficiencies.
Rationale	The industrial sector spends approximately 25% to 40% of its factor costs of production towards energy. In a typical industry, motors and motors-driven systems consume no less than 60% of the electricity use. Current motors used in the country are likely to be sub-optimal in the efficiency levels given the legacy of production practices. Replacing such motors can offer competitive advantage to the businesses as well as the electricity suppliers as they can manage the loads properly.
Strategy	The strategy is to carry out a quick analysis of the efficiency levels of the existing systems, create an incentives mechanism partly funded by the utilities and the DOE. Key to the program success is the level of market offtake and the speed of delivery of the systems that are deployed.
Target Market Segment	Energy-intensive light industries and large industries where motive power forms a key part of the electricity consumption.

Program	Efficient Motors and Motors-Driven Systems Program
Tasks / Activities	a) Develop a database of light industries in the key regions b) Carry out energy audit studies to assess the current level of efficiency and improvement opportunities c) Launch a pilot replacement program in key industries d) Launch a competitive bidding process to shortlist suppliers of motors and motor-driven systems e) Carry out a marketing and awareness program to sensitize the industrial consumers to participate in the replacement initiative f) Define the program monitoring and evaluation framework and assess the program benefits at a pre-determined periodicity
Expected Outputs	a) Reduced industrial loads emanating from the motors and motor-driven systems b) Reduced outages in the industrial parks
Implementing Agency	DUs in collaboration with DOE
Other Stakeholders	Financial institutions, system suppliers and integrators, end-users, energy services companies/ energy auditors.
Monitoring Procedures	Sample-based survey of at least 5% of the replaced units on a perpetual basis (once a year) and capturing the electricity savings when the actual replacement takes place (pre and post installations).
Budget Estimate	US$300,000 set-up as a budget for design and implementation of incentive and financial mechanisms.
Implementation Timeframe	24 months

7.3.2.6 Program 6: Efficient Cold-Chains Chillers Program

This program aims to facilitate efficient use of chillers in supermarkets and through the value-chains of fisheries, meat and horticulture produce. Given the level of urbanization and the food waste throughout the region, most of the fresh produce is stored in the cold-chains throughout its journey from the oceans-to-plates and farm-to-fork. Factor costs of the chilling units during the stationery storages are controllable as the maintenance of the old-chillers, moving towards refrigerants that have lower ozone-depleting potential, better designs of the chillers such as scroll compressors, changing the refrigeration cycles to operate on liquid nitrogen systems are some examples of such technical solutions. The proposed technical solutions need technical, policy, financial and service-delivery solutions that are proposed to be included in this program.

Table 7-8: Program 6 - Efficient Cold-Chain Chillers Program

Program	Efficient Cold-Chain Chillers Program
Sector	Food processing industry and supermarkets
Strategic Objective	Strategic conservation through adoption of energy efficient chiller units that use refrigerants with lowest ozone depleting potential, lowest specific electricity consumption.
Rationale	Electricity use is a key component of organizing food chains, storage and retail sales. The cost of electricity impacts the overall cost of food security. The chillers used at various stages in the value-chains of seafood, poultry and horticulture produce have longer vintages and are not maintained to the desired level as the operators do not possess core competence in such services. Improved efficiency levels of the chiller units is an important contribution to the sector as that would result in reduced electricity costs and reduce the peak demand of the end-use.
Strategy	The strategy is to conduct energy audits of chillers and the refrigeration systems and develop a set of solutions that would result in improved energy efficiency of the chiller units and reduce the costs of the operations
Target Market Segment	Energy-intensive storage, food processing, bulk storage in large warehouses and storage at the retail outlets/point of sale.
Tasks / Activities	a) Develop a database of cold storages, warehousing and large retail outlets to shortlist of cohort of detailed energy audits to assess the energy consumption and efficiency of operations b) Pilot no-cost, low-cost measures and replacement of chiller units in a small cohorts of end-uses c) Define a large-scale chiller replacement initiative including setting technical standards, best practices by way of a bulk procurement process d) Deploy no-cost, low-cost retrofitting programs and replacements targeting at least 10% of the territory-wide replacements
Expected Outputs	a) Improved efficiency levels of chillers throughout the value-chains of the seafood, poultry and horticulture industry b) Improved food security and reduced food wastages
Implementing Agency	DUs in collaboration with DOE

Program	Efficient Cold-Chain Chillers Program
Other Stakeholders	Financial institutions, system suppliers and integrators, end-users, energy services companies/ energy auditors, producers' groups.
Monitoring Procedures	Sample-based survey of at least 5% of the replaced units on a perpetual basis (once a year) and capturing the electricity savings when the actual replacement takes place (pre and post installations).
Budget Estimate	US$300,000 set-up as a budget for design and implementation of incentive and financial mechanisms.
Implementation Timeframe	24 months

7.3.2.7 Program 7: Consumer EE&C Awareness Program

The consumer EE&C awareness program aims to educate electricity consumers on the running and life-cycle costs of a range of electrical equipment and household appliances and to provide energy saving tips. This will lead to adoption of EE&C behaviors among electricity consumers and reduction of electricity consumption with no-cost and low-cost investment. The EE&C awareness campaign will be undertaken through different printed and electronic media as well as reminder slips distributed with monthly electricity bills.

Table 7-9: Program 7 – Consumer EE&C Awareness Program

Program	Consumer EE&C Awareness Program
Sector	All end-use sectors
Strategic Objective	Strategic conservation through educating electricity consumers on the running and life-cycle costs of a range of electrical equipment and household appliances and to provide energy saving tips so that they may reduce consumption. This will be undertaken through different printed and electronic media as well as reminder slips distributed with monthly electricity bills.
Rationale	A wide range of electrical equipment and domestic appliances constitutes DUs' load profiles and many of which are likely to be operating during the peak period. A general lack of appreciation by electricity consumers in life-cycle costs and simple energy conservation practices (such as switching off when not in use and regular maintenance) results in inefficient and unproductive uses of electricity. Despite decades of EE&C campaigns by DOE, there remains an extremely low level of EE knowledge with most

Program	Consumer EE&C Awareness Program
	stakeholders in the Philippines[32]. Although, some DUs have already implemented awareness and educational campaigns on EE&C, a coordinated information, education and communication (IEC) effort among DUs, ERC, NEA and DOE has not yet been initiated.
Strategy	There are a number of electrical equipment and appliances where changes in customer behavior or improvements in maintenance practices can save energy. The lack of EE&C awareness and knowledge has been regarded as one of the main barriers to EE&C behaviors among electricity consumers. Hence, the strategy is to educate the consumers on the benefits of choosing EE appliances, proper operation and maintenance.
Target Market Segment	All appropriate market segments in industrial, commercial, residential and public sectors.
Tasks / Activities	a) Preparation of communication materials ● Conduct review of relevant communication and marketing materials from the similar undertaking in the Philippines and other countries ● Select market sectors (industrial, commercial, residential) for program promotion ● Prepare printed and electronic communication materials for each sector in both English and Tagalog. The communication and marketing materials shall be designed to be "user friendly" with information on the running costs of commonly used appliances, along with suggestions on how to save energy for each type of equipment. b) Conduct public awareness campaign ● Finalize marketing strategy and implement - Primarily existing DUs outreach mechanisms (e.g., meter readers and branch offices) will be utilized. Other sources would include social medias, churches and other social gathering. ● Organize or participate in seminars or events where relevant. ● Include energy saving tips in printed and electronic electricity bills. ● Set up a "hotline" for providing advice to consumer on electrical appliances and energy conservation. c) Conduct random surveys to get customer feedback on the effectiveness of the campaigns.

[32] https://www.energytransitionpartnership.org/resource/diagnostic-analyses-report-of-energy-efficiency-development-in-the-philippines/

Program	Consumer EE&C Awareness Program
Expected Outputs	a) Increased awareness and knowledge of electricity consumers on EE&C b) Reduction of electricity consumption by electricity consumers
Implementing Agency	DOE, NEA, ERC and DUs.
Other Stakeholders	Consumer groups, suppliers of energy consuming products, media companies
Monitoring Procedures	Pre- and post-market surveys of awareness levels and trend of electricity consumption and intensity.
Budget Estimate	To be determined based on number of customers and geographical coverage of DUs
Implementation Timeframe	Ongoing

7.3.2.8 Program 8: DSM Load and Market Research Program

The DSM Load and Market Research Program aims to generate a sound understanding of the operations/performance of "end-uses" and behavior of "end-users". The load research component will enable DUs to identify causes of the system load profiles and help DUs design DSM programs that tend to address such causes. The market research component will enable DUs to understand customers' behavior and appropriate means to influence electricity usage levels and patterns.

Table 7-10: Program 8 - DSM Load and Market Research Program

Program	DSM Load and Market Research Program
Sector	All end-use sectors
Strategic Objective	Load Research is aimed at providing detailed understanding of utility's system load profile.
Rationale	DSM has been identified as a highly effective substitute for traditional, high risk, supply-side options of meeting long and short-term changes in electricity demand. Successful implementation and post-implementation impact assessment of DSM objectives are difficult to achieve unless programs are designed on a sound basis. These results are strictly dependent on the operations/performance of "end-uses" and behavior of "end-users".

Program	DSM Load and Market Research Program
	The shape of a utility's system profile forms the basis for setting DSM objectives, i.e., Strategic Conservation, Strategic Load Growth, Peak Clipping, Valley Filling, Flexible Load etc. Once the DSM Load-Shape Objectives are established, it is important to identify the causes for the issue that had determined the load shape objectives (e.g., causes responsible for a sharp Peak). Identification of such causes helps utility to design DSM programs that tend to reduce the effects of such cause e.g., high use of low efficient lighting or ACs in households during evening peak. In order to influence electricity usage levels and patterns by influencing customer behavior requires detailed understanding of customer's demographic, psychographic and behavioral attributes. Such detailed study of customer is the domain of Market Research.
Strategy	Load Research aims at providing detailed understanding of utility's system load profile. This includes providing breakdown of system load profile by its basic components i.e., by the sector, by segments in the sector, by end-uses of electricity by each segment and by the end-use technologies that consumers use for end-uses of electricity. This way very causes of electricity demand at any given point is known, thereby providing the opportunity to address the issues related with electricity demand at any point of time (load management). From the information related with appliance/equipment possession and usage behavior of the customers load shapes of end-uses and end-use technologies for various types of customers are produced. For a given type of customers (customers in same segment), aggregation of load profiles of various end-uses and end-use technologies produces segment profiles. Aggregation of segment profiles, in turn produces, sector load profiles, which when aggregated produce the regional system load profiles. Finally, the aggregation of regional load profiles provides the utility's system load profile.
Target Market Segment	All appropriate market segments in Industrial, Commercial, Residential and Public Sectors.
Tasks / Activities	**a) Prepare Load and Market Research Guidebook** 1) Preparation of a comprehensive step-by-step Guidebook for the conduct of Load and Market Research. 2) Preparation of technical specifications for procurement of load research equipment. **b) Conduct Load Research** 1) *Identify customer sectors and segments*: Segmentation of customers based on tariff categories; and further

Program	DSM Load and Market Research Program
	segmentation of customers in a sector on the basis of their similarities of electricity usage levels and patterns 2) *Collect required data*: All data related with customers is collected from a statistically well representative of the customer population and the sample for metering purpose is a sub-sample of actual sample; and the results inferred back to the customer population and with greater degree of accuracy. The type and sources of data typically include End-Use Data, Metered segment profiles, Energy Sales data, Generation, Transmission and Distribution data. 3) *Produce average load profile for major end-uses for each segment*; Analysis of end use data and developing end-use load profiles and aggregating all major end-uses to produce estimated whole site or segment load profile. 4) *Produce average load profile for each segment*: Average segment load profiles for all segments are produced for a typical weekday, weekend and a peak day. As in case of segment load profiles produced from end-use data, the segment profiles from metered data represent an average customer in the respective segment 5) *Reconcile estimated segment load profiles with metered data and historical billing data*: Validation of the two data sources to ensure any deviation is within the expected margins. 6) *Aggregate load profiles at end-use, segment and sector levels to produce system load profile*: Applying population weights to the average end-use load profiles for producing net segment load profiles. The net segment load profiles are transformed into sector load profiles by aggregating all segment load profiles in each sector. The aggregation of load profiles of all major sectors to produce the system profile, excluding losses and other unaccounted load i.e. non-metered sites and electricity theft 7) *Verify Segment, Sector and System load profiles*: The verification of sector load profiles produced against energy sales data and the system load profile using generation, transmission, and sub-station feeder. **c) Conduct Market Research** 1) *Development of Survey Questionnaires:* The first step is to develop survey instruments for each customer class. The survey instrument is designed to develop a database of customer facility characteristics, occupancy, appliance ownership, customer energy consumption, and energy use pattern during typical weekdays and holidays. The survey instrument is also used to elicit customer's response to issues related to power quality and the DU's customer

Program	DSM Load and Market Research Program
	service. Urban and rural areas should be well represented in the surveys, as should customers in various income strata in the residential sector. The survey of commercial consumers should cover different types of establishments such as small and large retail stores, hotels, restaurants, office buildings, educational institutions, public institutions, etc. In case of industrial consumers the survey should cover small, medium and large facilities, and major industry categories such as cement, textiles, etc. 2) *Sampling and conduct of surveys:* The sample size is selected based on an analysis of number of customers and electricity use, the desired accuracy and confidence levels, available budget and staff limitations. It is proposed that a market survey firm to be contracted to complete the customer surveys. 3) *Survey Analysis and Reporting*: Customer load surveys provide invaluable information on the time pattern of electricity use for major end-uses. This data can be used to develop load shapes for specific end-uses in each customer strata and customer class. Customized formats is to be prepared for the analysis of the data obtained from the field surveys. End-use load shapes can be estimated using hourly electricity use data for various appliances. The database can be used to estimate the average appliance ownership for customers in each customer strata and customer class and thus estimate the average connected load for each customer strata. The load factor for customers in different strata and customer class can be estimated by linking the connected load data with the monthly electricity consumption.
Expected Outputs	a) Load research is an important utility activity and provides a wealth of information essential to several key utility functions such as System Planning and Operation, Load forecasts, DSM Planning and Tariff Design. b) *Planning, designing and implementing DSM programs* – The information from load research studies combined with market survey data provides key information on how customers use electricity. Load research also provides valuable information on customer classes, or provinces, which contribute to the peak and what appliances contribute to the peak. This information is key to developing and designing suitable DSM programs which meet utility objectives.
Implementing Agency	DOE, NEA and ERC are potential agencies for coordinating this activity.

Program	DSM Load and Market Research Program
Other Stakeholders	Utility electrical contractors, consumer groups, the Philippine Statistics Authority (PSA) and market research organizations.
Monitoring Procedures	N/A
Budget Estimate	To be determined based on number of customers and geographical coverage of DUs
Implementation Timeframe	12 months

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9 APPENDIX A

Recommended key focus areas of new DSM Circular to be prepared by DOE.

- **DSM as resource options** – DSM has already been allowed for consideration in the annual DDPs and PSPPs prepared by DUs, however, the full impacts of DSM (including DR and DER) will not be fully realized unless DSM options can participate in the electricity market as resource options for electricity supply. Therefore, it is crucial for the new DSM Circular to enable DSM (including EE, load management, DR and DER) as alternative resources in the electricity market.

- **Creation of public benefit fund** – The new DSM Circular shall create a public benefit fund to serve as a funding mechanism for DSM, EE and RE initiatives. The public benefit fund can be financed through a charge on customers' utility bills or contributions from donor agencies. Surcharges collected by the state-level public benefit funds in the US range from $0.0003 to $0.005 per kWh. Unlike the existing Reinvestment Fund for Sustainable Capital Expenditures (RFSC) which is exclusive for ECs for capital expenditures or other projects approved by ERC, the public benefit fund shall be accessible to all DUs in the Philippines to foster a more inclusive and widespread adoption of DSM programs. Administration of the public benefit fund can be overseen by government, semi-government or non-government organizations.

- **DSM portfolio obligation** – With creation of the public benefit fund, DUs can be enjoined to include a specific percentage of electricity supply from DSM, EE and RE resources. Management of load and demand, such as procurement of DR to address the peak demand, can also be part of the DSM portfolio. The level of these alternative resources can be gradually adjusted based on DUs performance and market dynamics.

- **Load and market research obligation** – Under the DSM portfolio obligation, DUs shall periodically conduct load and market research activities within their franchise areas. Load research is the foundation of any DSM program design, and its primary objective is to identify the consumer segment/s and specific end-uses that impact the utility load shape. Market research allows for identifying effective DSM technologies that influence utility's load shape.